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INDUSTRIAL CONSOLIDATIONS IN THE UNITED STATES.

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It is hardly neccessary to say that in the preparation of this brief article upon consolidations in the United States there is no intention of introducing into these publications any argument either in favor of or against the so-called trusts. On the contrary, it is attempted merely to present in condensed form, as an intelligent basis for investigation, some elementary data of the "consolidation movement," particularly its proportions from year to year, and roughly its relations to general conditions with a view to suggesting a few of the chief causes and influences bearing upon it. For this purpose the following compilation has been prepared, showing in detail and also in chronological order the organization of industrial consolidations in the United States. The term "industrial" is used in its narrower Wall Street sense, to the exclusion of the large number of consolidations formed in the railway world, street railways, gas and electric lighting and similar fields. Only companies having a capitalization of $1,000,000 or more have been considered. The figures given are of authorized and not issued capitalization, as the

latter is much the more subject to change. Division is made into preferred stock, common stock and bonds, the last named including debentures, where such have been employed. As one of the chief features of the table is its comparison year by year, the original capital of the respective companies has in nearly every case been given, indicating subsequent increases later, as such increases obviously should be considered as a part of the total capitalization in the years when made; reductions in authorized capitalization have also been indicated.

It may be said that in most cases the issued capitalization of the companies given does not vary widely from the amounts authorized. Among the conspicuous exceptions are the Illinois Steel Company, which issued only about $18,000,000 of its $50,000,000 capital stock; the Federal Steel Company, which retains about half its $200,000,000 of stock in its Treasury; the American Brass Company, which has issued but $8,000,000 of its $20,000,000 authorized stock; the Distilling Company of America, the issued stocks of which amount to roughly $77,000,000 against an authorized total of $125,000,000; and the Rubber Goods Manufacturing Company, which has unissued in its Treasury about one half its $50,000,000 capital. Following is the list in detail:—

Year when Incorporated.	Authorized Capitalization. Stock. *Preferred.*	*Common.*	*Bonds.*
Previous to 1887.			
American Screw Co., 1860 . .	$ . . .	$3,250,000	$ . . .
d Standard Oil Trust, 1872 . .	. . .	97,250,000	. . .
x Westinghouse Electric & Mfg. Co., 1872	4,000,000	6,000,000	. . .
x Union Switch & Signal Co., 1882	500,000	1,000,000	500,000
d American Cotton Oil Trust, 1884	. . .	40,000,000	. . .
d National Linseed Oil Trust, 1885	. . .	18,000,000	. . .
Total . .	$4,500,000	$165,500,000	$500,000

Footnote.— The sign *x* indicates that the capitalization was increased later, *z* that it was reduced; *d* denotes that the item is duplicated later in the list (see appendix); *r* denotes that company was reorganized; *b* indicates 1st and 2d preferred stock, *u* underlying bonds, *y* part underlying bonds and part direct issues.

Year when Incorporated.	Authorized Capitalization. *Stock.*		
	Preferred.	*Common.*	*Bonds.*
1887.			
z Southern Cotton Oil Co.	$ . . .	$5,000,000	$ . . .
xd National Cordage Co.	5,000,000	10,000,000	. . .
zd National Lead Trust	. . .	90,000,000	. . .
Pacific Coast Borax Co.	1,000,000	1,500,000	. . .
d Sugar Refineries, The (trust)	. . .	50,000,000	. . .
Safety Car Heating and Lighting Co.	. . .	5,000,000	. . .
rd National Linseed Oil Co.	. . .	18,000,000	. . .
d Distilling & Cattle Feeding Trust	. . .	30,726,000	. . .
Total, 1887	$6,000,000	$210,226,000	
1888.			
x Electric Storage Battery Co.	$5,000,000	$8,500,000	$450,000
New York Breweries Co.	1,500,000	1,500,000	1,650,000
Tidewater Oil Co.	. . .	5,000,000	. . .
Total, 1888	$6,500,000	$15,000,000	$2,100,000
1889.			
American Cotton Oil Co.	$15,000,000	$20,237,100	$5,000,000
" Axe & Tool Co.,	. . .	3,872,500	. . .
x Diamond Match Co.	. . .	7,500,000	. . .
d Illinois Steel Co.	. . .	50,000,000	13,200,000
Indianapolis Breweries Ltd.	665,000	665,000	800,000
American Pipe Mfg. Co.	. . .	1,000,000	. . .
Chicago Breweries Ltd.	. . .	3,000,000	2,000,000
z Consolidated Car Heating and Lighting Co.	. . .	2,500,000	. . .
Denver United Breweries Co.	1,000,000	1,000,000	1,000,000
Western Stone Co.	. . .	2,000,000	500,000
American Strawboard Co.	. . .	6,000,000	1,250,000
St. Louis Breweries Ltd.	4,500,000	4,500,000	5,000,000
Total, 1889	$21,155,000	$102,274,600	$28,750,000
1890.			
d American Biscuit & Mfg. Co.	$ . . .	$9,000,000	*a* $545,000
" Book Co.	. . .	5,000,000	. . .
x " Tobacco Co.	14,000,000	15,000,000	. . .
" Mfg. Co. (bagging)	. . .	3,111,500	. . .
" Shot & Lead Co.	. . .	3,000,000	. . .

a, Amount issued ; 1, incorporation of these companies was not confirmed.

Year when Incorporated.	Authorized Capitalization. *Stock.*		
	Preferred.	*Common.*	*Bonds.*
1890.—*Continued.*			
Celluloid Co.	$ . . .	$6,000,000	$ . . .
Chicago Junction Railways and Union Stock Yards	6,500,000	5,500,000	13,000,000
rd Distilling & Cattle Feeding Co.	. . .	35,000,000	. . .
rd National Starch Mfg. Co.	*b* 5,500,000	5,000,000	4,500,000
r " Harrow Co.	. . .	2,000,000	. . .
d New York Biscuit Co.	. . .	10,000,000	1,500,000
[3]*r* United States Book Co.	2,000,000	2,000,000	1,000,000
[1]*d* United States Baking Co.	. . .	5,000,000	. . .
Total, 1890,	$28,000,000	$106,611,500	$20,545,000
1891.			
American Cereal Co.	$ . . .	$3,400,000	$1,550,000
x " Sugar Refining Co.	25,000,000	25,000,000	. . .
z " Lithographic Co.	3,500,000	8,500,000	. . .
" Wringer Co.	350,000	1,650,000	. . .
" Soda Fountain Co.	*b* 2,500,000	1,250,000	. . .
" Steel Casting Co.	1,350,000	2,850,000	. . .
r Atlas Tack Co.	. . .	700,000	300,000
d Consolidated Steel and Wire Co.	. . .	4,000,000	. . .
International Elevating Co.	. . .	2,200,000	. . .
x National Casket Co.	. . .	3,000,000	. . .
d " Tube Works Co.	5,750,000	5,750,000	. . .
" Lead Co.,	15,000,000	15,000,000	. . .
z " Rice Milling Co.	2,000,000	3,000,000	. . .
United States Glass Co.	. . .	5,000,000	. . .
" " Printing Co.	. . .	3,500,000	. . .
Yellow Pine Co. ,	900,000	1,200,000	. . .
Pittsburg Plate Glass Co.	150,000	9,850,000	. . .
Total	$56,500,000	$95,850,000	$1,850,000
x American Tobacco Co. (increase)	. . .	6,000,000	. . .
d National Cordage Co. "	. . .	. . .	6,000,000
Grand total, 1891	$56,500,000	$101,850,000	$7,850,000
1892.			
z American Typefounders Co.	$4,000,000	$5,000,000	$ . . .
x Colorado Fuel & Iron Co.	2,000,000	11,000,000	6,500,000
z General Electric Co.	4,252,000	30,460,000	. . .
rd Hecker-Jones-Jewell Milling Co.	3,000,000	2,000,000	2,500,000
rd Herring-Hall-Marvin Co.	1,500,000	1,800,000	. . .

3, Company dissolved owing to failure of reorganization plan.

Year when Incorporated.	Authorized Capitalization. Stock.		
	Preferred.	*Common.*	*Bonds.*
1892.—*Continued.*			
d Michigan Peninsular Car Co.	$5,000,000	$3,000,000	$2,000,000
c National Wall Paper Co.	. . .	30,000,000	. . .
New York Wire Cloth Co.	400,000	600,000	. . .
Trenton Potteries Co.	1,250,000	1,750,000	. . .
United States Rubber Co.	25,000,000	25,000,000	. . .
Total	$46,402,000	$110,610,000	$11,000,000
American Sugar Refining Co. (increase)	12,500,000	12,500,000	. . .
Western Stone Co. (increase)	. . .	250,000	150,000
Grand Total, 1892	$58,902,000	$123,360,000	$11,150,000
1893.			
International Pulp Co.	$2,000,000	$3,000,000	$ . . .
Lake Superior Consolidated Iron Mines	. . .	30,000,000	. . .
d Manhattan Spirit Co.	. . .	5,000,000	. . .
rd United States Cordage Co.	14,000,000	20,000,000	7,500,000
United States Leather Co.	64,000,000	64,000,000	10,000,000
Union Typewriter Co.	*b* 8,015,000	10,000,000	. . .
	$88,015,000	$132,000,000	$17,500,000
x Diamond Match Co. (increase)	. . .	1,500,000	. . .
Total, 1893,	$88,015,000	$133,500,000	$17,500,000
1894.			
d Carnegie Steel Co., Ltd.	$ . . .	$25,000,000	$ . . .
x American Glue Co.	1,000,000	1,400,000	. . .
d National Linseed Oil Co. (increase)	. . .	. . .	3,000,000
Total, 1894,	$1,000,000	$26,400,000	$3,000,000
1895.			
d American Spirits Mfg. Co.	$7,000,000	$28,000,000	$2,000,000
d Consolidated Ice Co.	3,500,000	6,500,000	*u* 1,255,000
r Brooklyn Wharf & Warehouse Co.	*b* 7,500,000	5,000,000	17,500,000
r Pennsylvania Steel Co.	1,500,000	5,000,000	7,000,000
x Virginia Carolina Chemical Co.	2,500,000	4,000,000	. . .
d Welsbach Commercial Co.	3,500,000	3,500,000	. . .
x Diamond Match Co. (increase)	. . .	2,000,000	. . .
Total, 1895,	$25,500,000	$54,000,000	$27,755,000

c, Company dissolved in 1900. The original capital was only $14,000,000 but no record of the dates of increase obtained.

Year when Incorporated.	Authorized Capitalization. *Stock.*		
	Preferred.	*Common.*	*Bonds.*
1896.			
American Electric Heating Corporation.	$ . . .	$10,000,000	$500,000
Central Fireworks Co.	1,750,000	1,750,000	. . .
x Pure Oil Co.	. . .	1,000,000	. . .
d Spirits Distributing Co.	*b* 3,675,000	3,675,000	. . .
Standard Rope & Twine Co.	. . .	12,000,000	10,500,000
Westinghouse Electric & Mfg. Co. (increase)	. . .	5,000,000	. . .
Total, 1896.	$5,425,000	$33,425,000	$11,000,000
1897.			
x American Malting Co.	$15,000,000	$15,000,000	$ . . .
r " Wood Working Machinery Co.	2,000,000	2,000,000	2,000,000
Glucose Sugar Refining Co.	14,000,000	26,000,000	. . .
dx Shelby Tube Co.	. . .	5,000,000	. . .
Total, 1897.	$31,000,000	$48,000,000	$2,000,000
1898.			
American Linseed Co.	$16,750,000	$16,750,000	$ . . .
dr " Fisheries Co.	2,000,000	8,000,000	. . .
d " Steel & Wire Co. of Ill.	12,000,000	12,000,000	. . .
" Tin Plate Co.	20,000,000	30,000,000	. . .
" Thread Co.	6,000,000	6,000,000	6,000,000
d Atlantic Snuff Co.	. . .	10,000,000	. . .
Cleveland & Sandusky Brewing Co.	3,000,000	3,000,000	6,000,000
x Continental Tobacco Co.	37,500,000	37,500,000	. . .
Federal Steel Co.	100,000,000	100,000,000	*u* 26,600,000
International Paper Co.	25,000,000	20,000,000	10,000,000
" Silver Co.	9,000,000	11,000,000	4,500,000
Knickerbocker Ice Co. (Chicago)	3,000,000	4,000,000	2,000,000
Maryland Brewing Co.	3,250,000	3,250,000	7,500,000
r National Shear Co.	1,500,000	1,500,000	. . .
" Biscuit Co.	25,000,000	30,000,000	*u* 1,800,000
d Standard Distilling & Distributing Co.	8,000,000	16,000,000	. . .
d Union Tobacco Co.	12,000,000	12,000,000	. . .
United States Envelope Co.	3,750,000	1,000,000	2,000,000
United Breweries Co. (Chicago)	. . .	5,600,000	3,500,000
Otis Elevator Co.	4,500,000	6,500,000	. . .
	$289,250,000	$334,100,000	$69,900,000

Year when Incorporated.	Authorized Capitalization. *Stock.*		
	Preferred.	*Common.*	*Bonds.*
1898.—*Continued.*			
INCREASES			
Union Switch & Signal Co.	$ . . .	$ . . .	$500,000
United States Rubber Co.	. . .	. . .	*u* 5,000,000
Virginia-Carolina Chemical Co.	. . .	*k* 5,500,000	. . .
Westinghouse Electric & Mfg. Co.	. . .	. . .	*y* 4,350,000
Grand Total, 1898,	$289,250,000	$339,600,000	$79,750,000
1899.			
Alabama & Georgia Consolidated Coal & Iron Co.	$650,000	$650,000	$ . . .
d American Saddle Co.	800,000	1,000,000	. . .
" School Furniture Co.	5,000,000	5,000,000	. . .
" Brass Co.	. . .	20,000,000	. . .
" Steel and Wire Co.	40,000,000	50,000,000	. . .
" Radiator Co.	5,000,000	5,000,000	. . .
" Car & Foundry Co.	30,000,000	30,000,000	. . .
" Ice Co.	30,000,000	30,000,000	. . .
" Woolen Co.	25,000,000	40,000,000	. . .
" Felt Co.	2,500,000	2,500,000	500,000
" Shipbuilding Co.	15,000,000	15,000,000	. . .
" Beet Sugar Co.	5,000,000	15,000,000	. . .
Amalgamated Copper Co.	. . .	75,000,000	. . .
American Steel Hoop Co.	14,000,000	19,000,000	. . .
" Smelting & Refining Co.	32,500,000	32,500,000	. . .
" Bicycle Co.	10,000,000	20,000,000	20,000,000
" Hide & Leather Co.	17,500,000	17,500,000	10,000,000
" Agricultural Chemical Co.	20,000,000	20,000,000	. . .
d Asphalt Company of America	. . .	30,000,000	5 30,000,000
Atlantic Clay Co.	1,000,000	2,000,000	. . .
American Grass Twine Co.	. . .	15,000,000	. . .
" Pastry & Mfg. Co.	1,000,000	2,000,000	. . .
" Writing Paper Co.	12,500,000	12,000,000	17,000,000
" Chicle Co.	3,000,000	6,000,000	. . .
" Pneumatic Service Co.	5,000,000	10,000,000	. . .
Alabama Cons. Coal & Iron Co.	2,500,000	2,500,000	. . .
American Iron & Steel Co.	3,000,000	17,000,000	. . .
" Cement Co.	. . .	2,100,000	1,000,000
" Window Glass Co.	4,000,000	13,000,000	. . .
Baltimore Brick Co.	900,000	1,200,000	1,500,000
d Columbia Electric Car Lighting & Brake Co.	. . .	10,000,000	. . .

k, Common and preferred.

5, Trust certificates issued against stock held in trust.

Year when Incorporated.	Authorized Capitalization. *Stock.*		
1899.—*Continued.*	*Preferred.*	*Common.*	*Bonds.*
Consolidated Rubber Tire Co.	$5,000,000	$5,000,000	$ . . .
California Fruit Packers' Association	. . .	2,500,000	. . .
Consolidated Lake Superior Co.	6,000,000	14,000,000	. . .
Continental Cotton Oil Co.	3,000,000	3,000,000	. . .
Central Foundry Co.	7,000,000	7,000,000	4,000,000
[4]Distilling Company of America	55,000,000	70,000,000	*u* 1,899,000
Empire Steel & Iron Co.	2,500,000	2,500,000	. . .
Electric Boat Co.	5,000,000	5,000,000	. . .
General Chemical Co.	12,500,000	12,500,000	. . .
Great Lakes Towing Co.	2,500,000	2,500,000	. . .
General Aristo Co.	2,500,000	2,500,000	. . .
Havana Commercial Co.	7,500,000	12,500,000	. . .
Havana-American Co.	3,000,000	7,000,000	. . .
International Power Co.	600,000	7,400,000	. . .
" Steam Pump Co.	12,500,000	15,000,000	. . .
" Car Wheel Co.	5,000,000	10,000,000	. . .
" Automobile & Vehicle Tire Co.	1,500,000	1,500,000	. . .
d Kentucky Distilleries & Warehouse Co.	12,000,000	20,000,000	. . .
Keystone Watch Case Co.	2,200,000	1,100,000	. . .
Monongahela River Consolidated Coal & Coke Co.	10,000,000	20,000,000	10,000,000
Mt. Vernon Woodbury Cotton Duck Co.	. . .	9,500,000	14,000,000
National Carbon Co.	4,500,000	5,500,000	. . .
National Enameling & Stamping Co.	10,000,000	20,000,000	. . .
" Steel Co.	27,000,000	32,000,000	*u*2,561,000
" Salt Co.	5,000,000	7,000,000	. . .
" Tube Co.	40,000,000	40,000,000	. . .
" Glass Co.	. . .	4,000,000	2,000,000
New England Cotton Yarn Co.	6,500,000	5,000,000	5,700,000
Niles-Bement-Pond Co.	3,000,000	5,000,000	. . .
Pressed Steel Car Co.	12,500,000	12,500,000	. . .
Pacific American Fisheries Co.	. . .	5,000,000	. . .
" Coast Biscuit Co.	1,500,000	2,500,000	1,500,000
e Pullman Co.	. . .	74,000,000	. . .
Paterson Brewing & Malting Co.	. . .	3,000,000	. . .
Pittsburg Stove & Range Co.	1,000,000	1,000,000	. . .
Pittsburg Coal Co.	32,000,000	32,000,000	. . .

4, This Company in 1901 issued $4,000,000 more bonds.
e, Date of consolidation with Wagner Co.

Year when Incorporated.	Authorized Capitalization. *Stock.*		
1899.—*Continued.*	*Preferred.*	*Common.*	*Bonds.*
Pittsburg Brewing Co.	$6,500,000	$6,500,000	$6,500,000
Rubber Goods Manufacturing Co.	25,000,000	25,000,000	. . .
Royal Baking Powder Co.	10,000,000	10,000,000	. . .
Republic Iron & Steel Co.	25,000,000	30,000,000	. . .
Rochester Optical & Camera Co.	. . .	3,500,000	. . .
Seacoast Packing Co.	3,000,000	5,000,000	. . .
Standard Sanitary Mfg. Co.	2,500,000	2,500,000	2,500,000
" Phosphate & Fertilizer Co.	400,000	600,000	. . .
Sloss-Sheffield Steel & Iron Co.	10,000,000	10,000,000	*u* 3,835,000
Springfield (Mass.) Breweries Co.	1,150,000	1,150,000	1,150,000
Standard Shoe Machinery Co.	2,000,000	3,000,000	. . .
Union Bag & Paper Co.	11,000,000	16,000,000	. . .
U. S. Cast Iron Pipe & Foundry Co.	15,000,000	15,000,000	. . .
United Fruit Co.	. . .	20,000,000	. . .
rd United States Flour Milling Co.	12,500,000	12,500,000	15,000,000
d United Starch Co.	2,500,000	3,500,000	. . .
United Shoe Machinery Co.	12,500,000	12,500,000	. . .
United States Finishing Co.	2,000,000	1,000,000	1,750,000
" " Bobbin & Shuttle Co.	950,000	1,050,000	. . .
Virginia Iron, Coal & Coke Co.	. . .	10,000,000	10,000,000
Total	$726,150,000	$1,188,750,000	$162,395,000
[6] Deduct duplicates	12,800,000	21,000,000	. . .
Net Total	$713,350,000	$1,167,750,000	$162,395,000
INCREASES.			
American Tobacco Co.	$ . . .	$35,000,000	$ . . .
" Malting Co.	. . .	. . .	5,000,000
Continental Tobacco Co.	12,500,000	12,500,000	. . .
Colorado Fuel & Iron Co.	. . .	12,000,000	. . .
Diamond Match Co.	. . .	4,000,000	. . .
Electric Storage Battery Co.	. . .	4,500,000	. . .
National Casket Co.	. . .	3,000,000	. . .
Standard Oil Co. of N. J.	. . .	100,000,000	. . .
Virginia-Carolina Chemical Co.	6,000,000	6,000,000	. . .
Total increases	$18,500,000	$177,000,000	$5,000,000
Grand Total, 1899	$731,850,000	$1,344,750,000	$167,395,000

6 This deduction is made here because in this year the American Saddle Co. was absorbed by the American Bicycle Co., and the Kentucky Distilleries & Warehouse Co. by the Distilling Co. of America.

Year when Incorporated.	Authorized Capitalization. *Stock.*		
1900.	*Preferred.*	*Common.*	*Bonds.*
e American Caramel Co. . .	$1,000,000	$1,000,000	$600,000
" Bridge Co. . . .	35,000,000	35,000,000	. . .
" Sheet Steel Co. . .	26,000,000	26,000,000	. . .
" Clay Manufacturing Co.	. . .	10,000,000	2,500,000
" Loom Co. . . .	. . .	1,000,000	. . .
" Snuff Co. . . .	12,500,000	12,500,000	. . .
" Sash & Door Co. .	2,500,000	3,500,000	. . .
" Rice Growers' Distributive Co.	1,000,000	14,000,000	. . .
Buffalo Union Furnace Co. . .	200,000	1,000,000	300,000
Carnegie Company . . .	. . .	160,000,000	160,000,000
Crucible Steel Company of America.	25,000,000	25,000,000	. . .
Consolidated Railway Electric Car Lighting & Equipment Co. . .	. . .	16,000,000	. . .
Consolidated Lime Co. . . .	1,500,000	1,500,000	. . .
Continental Gin Co. . . .	. . .	3,000,000	. . .
Compressed Air Co. . . .	755,000	7,245,000	500,000
Delta Cotton Oil Co. . . .	. . .	1,000,000	. . .
Fisheries Co.	2,000,000	1,000,000	500,000
Flint, Eddy & American Trading Co.	2,000,000	2,000,000	. . .
Herring-Hall-Marvin Co. . .	*b* 1,650,000	1,650,000	. . .
Illinois Brick Co.	4,000,000	5,000,000	. . .
International Fire Engine Co. .	4,000,000	5,000,000	. . .
g " Crude Rubber Co. .	10,000,000	20,000,000	. . .
" Emery & Corundum Co.	. . .	2,000,000	500,000
Jones & Laughlins	. . .	20,000,000	. . .
Magnus Metal Co.	1,500,000	1,500,000	. . .
National Sugar Refining Co. . .	10,000,000	10,000,000	. . .
" Asphalt Co. . . .	10,000,000	12,000,000	6,000,000
" Starch Co. . . .	4,500,000	5,000,000	8,000,000
New England Brick Co. . .	3,000,000	2,000,000	850,000
National Roofing & Corrugating Co.	. . .	5,000,000	. . .
" Leather Co. . . .	. . .	5,000,000	. . .
" Fish Co.	. . .	5,000,000	. . .
New York & Kentucky Co. . .	1,000,000	1,000,000	. . .
Pittsburg Valve, Foundry & Construction Co.	. . .	1,100,000	. . .
Pratt & Whitney Co. . . .	1,225,000	1,525,000	. . .
Rocky Mountain Paper Co. . .	600,000	750,000	. . .

e, Date of consolidation, not of incorporation; *g*, company incorporated, organization pending.

Year when Incorporated.	Authorized Capitalization. Stock. *Preferred.*	*Common.*	*Bonds.*
1909.—*Continued.*			
Standard Milling Co.	$6,900,000	$4,600,000	$5,750,000
" Chain Co.	1,500,000	1,500,000	700,000
Shelby Steel Tube Co.	6,000,000	9,000,000	. . .
United Metals Selling Co.	. . .	5,000,000	. . .
Union Talc Co.	. . .	1,000,000	600,000
Welsbach Co.	. . .	3,500,000	7,000,000
Total	$175,330,000	$448,870,000	$193,800,000
Pure Oil Co. (increase)	2,000,000	7,000,000	. . .
General Electric Co. (increase)	. . .	4,415,000	. . .
Grand Total, 1900,	$177,330,000	$460,285,000	$193,800,000
Total Entire Period.	$1,530,927,000	$3,264,782,100	$573,095,000
Duplicates and Reductions	117,025,800	719,635,600	89,000,000
Grand Net Total,	$1,413,901,200	$2,545,146,500	$484,095,000

The following summary shows the total capitalization year by year, together with the average capitalization per company for each year and for the entire period. In arriving at the per company capitalization, duplicates have been included and increases and reductions in capital excluded. This will be found entirely proper. For instance, the National Lead Trust in reorganization reduced its capital from $90,000,000 to $30,000,000. The new company should of course be included in any compilation intended to show the average capitalization for that year, while the reduction should not be allowed for but considered in the final net total. There is perhaps some inaccuracy in including in the total capitalization for a given year companies which are merely reorganizations of others previously appearing in the list, but as the capitalization is frequently changed in reorganization, it has been deemed best in the interest of clearness to take no notice of such duplication in any one year, but to deduct it from the total for the entire period. But when a complete duplication appears in any one year, as in 1899 when the Kentucky

Distilleries & Warehouse Company and the American Saddle Company were organized and later consolidated into larger companies in the same year, duplication has been allowed for in that year.

Year.	Number Companies.	Total Capitalization, Stock and Bonds.	*i* Average Capitalization Per Company.
1887	8	$216,226,000	$27,025,000
1888	3	23,600,000	7,867,000
1889	12	152,179,600	12,682,000
1890	13	155,156,500	11,935,000
1891	17	166,200,000	9,070,000
1892	10	193,412,000	16,800,000
1893	6	239,015,000	39,586,000
1894	2	30,400,000	13,700,000
1895	6	107,255,000	17,542,000
1896	5	49,850,000	8,970,000
1897	4	81,000,000	20,250,000
1898	20	708,600,000	34,662,000
1899	87	2,243,995,000	23,877,000
1900	42	831,415,000	19,500,000
Total.....	235	$5,198,304,100	*h* 20,900,000
Previous to 1887		170,500,000	
Grand total for all years..... .		$5,368,804,100	
Deduct reductions and duplications.....		925,661,400	
Grand net total entire period...		$4,443,142,700	

h Average for 14 years.

i The apparent discrepancy in these figures is explained above.

These comparisons are presented more forcibly in the accompanying charts.

A glance at the chart (No. 1) shows at once that the year 1899 was an extremely abnormal one in the consolidation movement. The movement in that year, in fact developed into a craze on the part of greedy promotors and vendors to unload properties upon the public at enormous prices. The figures for 1899, moreover, huge as they are, do not fully measure the proportions of industrial consolidation in that year. In addition to the companies shown, other projects amounting roughly in proposed capitalization to over one

billion dollars were undertaken and carried to advanced stages, later, however, to be abandoned.

Dismissing the year 1899 for the moment and turning to the earlier years covered by the tables, it will be seen that for the first seven years there was little special feature to the consolidation movement, except in 1888, when it suffered a sharp check, probably owing to the fact that the presidential election occurred in that year, exercising a deterring influence upon such ventures. This cause did not apparently have much effect in 1892, a circumstance which may perhaps be accounted for in part by the general overconfidence that President Harrison would be re-elected, thus ensuring a continuance of the same administration policy that had prevailed the previous four years. In 1894 there were almost no consolidations formed, the organization of the Carnegie Steel Company Ltd., being hardly entitled to inclusion in the list. For this the panic of 1893 may be held directly accountable. At a time when payments in Wall Street were made in Clearing House certificates instead of in cash, it would have been worse than ridiculous for a promoter to ask a banker to finance an "industrial proposition," the more so because in the minds of some the failure of the notorious Cordage "Trust" was regarded as one of the acute factors which precipitated that panic. It may be asked why this effect was not shown in 1893. The answer is that most of the consolidations of 1893 were formed before the panic. It should, moreover, be borne in mind that the organization of a large consolidation is not the work of a day, but that its incorporation usually follows months of preliminary work, so that the key to the movement in any given year, as shown by the figures, may often be found in the conditions prevailing in the preceding year.

Coming down to the year 1895, the table shows that the consolidation movement recovered somewhat from the check received in 1893, but in 1896 it was again interrupted, owing

no doubt, to the scare over Bryanism and free silver, attending the presidential election in that year. The small total in 1897 is probably due to the fact that conditions in 1896 did not favor the initiation of consolidation projects. In 1898, however, the movement made an abnormal advance, which, as already seen, become phenomenal in 1899. The sharp decline in 1900 was largely in the nature of a reaction from the excess to which the movement had been carried in the previous year. The stock market was so overloaded with new industrial securities in 1899 that promoters found great difficulty in the latter part of that year and in 1900 in inducing either bankers or the public to take up new flotations. The recurrence of another presidential election may also be again credited as a factor, but the chief influence was the difficulty in securing financial assistance for such schemes.

It would be interesting if some definite connection could be established between the course of the consolidation movement and general business conditions, with special reference to the factor of competition. That the suppression of competition or at least its regulation is one of the chief objects aimed at in consolidation is so obvious as to require no argument. Whether consolidation has been forced by competition, as has often been asserted, is another matter. Unfortunately the causes entering into the problem are so numerous that it is difficult to discuss any one separately. The period covered by the table, moreover, is probably too short to permit of the deduction of general laws with any degree of safety. It is at once evident, however, that years of abnormal depression, such as 1893 and 1896, are highly unfavorable to the organization of consolidations. On the other hand, the general high degree of prosperity in the latter part of 1899 inclined many manufacturers to retain the control of their business rather than accept consolidation proposals, and to some extent interfered with consolidation progress. In a general way, bearing in mind that the causes operating

in a given year may not be immediately reflected, it appears that periods when competition is extremely keen but before it has reached the point of extreme depression or panic are particularly calculated to encourage consolidation plans. This would agree fairly well with the figures given for the early nineties and also for those of 1899. There is no doubt, therefore, that competition is one of the important elements entering into the causes of industrial consolidation. On the other hand, the desire of securing inordinate profits by the sale of watered stock has played no small part in the movement.

The figures of average yearly capitalization per company (see chart No. 2) show at once that there has been no uniform tendency in this respect. On the contrary, the average has varied with much irregularity. It is not safe at once to jump to the conclusion that the years in which the average is largest are those when over-capitalization, which is unfortunately characteristic of the industrial consolidation movement as a whole, was most severe. The amount of capitalization, in other words, does not measure the amount of over-capitalization. There was far more over-capitalization in the American Fisheries Company, with $10,000,000 of stock, than in the Standard Oil Company with $100,000,000. The fact that in some years only a small number of companies were formed also tends to lower the value of the averages for purposes of comparison. It may, however, be worth noting that of the companies formed in 1893, when the average capitalization reached the highest point, the three largest, *viz.*, the United States Leather Company, the United States Cordage Company, and the Union Typewriter Company, were anything but conspicuous successes. The Leather "Trust" is now heavily in arrears upon its preferred stock dividends, and the same was until recently true of the Union Typewriter Company (which is now in more prosperous condition), while the history of the Cordage consolidation is too dismal to require mention. Of the companies organized in 1898, when the

average capitalization was also exceptionally high, four, or twenty per cent of the total number, have been notably unsuccessful. These are the American Linseed, the American Fisheries, the International Silver and the National Shear companies. It is only fair to say that the average in 1898 was brought up considerably by the fact that the total $200,000,000 authorized capitalization of the Federal Steel Company is used, while only about half that amount is issued. Using the issued capitalization of that company, the average for the year would be brought down to about $31,224,000. On the other hand, it does not appear that those companies formed when the average capitalization is lowest have been especially successful. Of the thirteen formed in 1890, four were later forced to go through the process of reorganization, and several of those incorporated in 1888 and 1896, when the average was also low, have made unsatisfactory showings.

In the years 1899 and 1900 the decline in average capitalization probably does indicate a certain amount of reduction in over-capitalization. The unwillingness of the public to take up industrial securities in the latter part of 1899 made bankers more cautious about financing such companies, and as a result promoters were in several cases forced to cut down their plans for capitalization. If, moreover, in arriving at the average for 1900, the Carnegie Company, with its unusually large capitalization of $320,000,000 (including bonds) is excluded, the average per company is brought down to about $14,500,000.

It appears, therefore, that figures of average capitalization should be used only with great caution in judging the merits of companies formed in any given year, but they are not without value.

It may be worth passing mention that the organization of industrial consolidations is largely effected in the early months of the year. An analysis on this point of the 164

companies formed since 1894 shows that the dates of incorporation are distributed as follows: —

Number incorporated in		*Number incorporated in*	
January	17	July	14
February	14	August	14
March	25	September	10
April	17	October	6
May	10	November	8
June	20	December	9
Total six months,	103	Total six months,	61

The same comparison is shown more graphically by Chart No. 3.

The distribution by months is easily explained. A large majority of these companies are financed in New York, and it is usually in the early months of the year that New York bank reserves accumulate and money becomes cheap or at least that interest rates work lower. This is a highly important consideration. Although the organization of these consolidations has been effected largely on a stock basis, a considerable amount of money is needed to provide working capital or to purchase outright plants that can be secured only for cash. When in the late spring of 1899 rates for money in New York advanced sharply, a decided check was given to the consolidation movement and many projects apparently on the eve of successful consummation were suddenly shelved, in many cases to be abandoned completely. The rather large number of charters taken out in June, July and August represents in part the completion of plans undertaken earlier in the year. The mid-summer months are unsuited for the organization of large corporations not only on account of the weather but because the vacation season finds many of those interested in such deals widely separated. In consequence, comparatively few companies are brought out in the late months of the year. New enterprises are, however, undertaken in those months which reach completion later.

The tariff has of course often been held responsible for the "Trusts." On this point the compilation gives little information of value. During the greater part of the period under consideration relatively high duties have been in force, while in the period covered by the lower so-called Wilson Tariff, other causes were at work which would in themselves account for the decreased activity in those years. To those who see in the tariff the chief cause of consolidation, it may be remarked that the protective policy was in effect for a score of years before the organization of "Trusts" attracted attention, while in Great Britain with its "Free Trade" policy, the organization of similar consolidations has also reached large proportions. It is not intended to assert that the tariff has had no influence upon industrial organization. This question, however, involves an argument of the "Trust" problem as a whole, which is not within the scope of this article.

To summarize briefly: It is admitted that competition has been one of the most active factors in the creation of trusts. On the other hand, the movement has been largely affected by the opportunity for disposing of the securities such corporations. The law of supply and demand has a direct application. Had the public continued in 1900 to purchase such securities with the same readiness they showed in 1899, there is little reason to doubt that the movement would have suffered no setback. It cannot be insisted too strongly, therefore, that those who contend that competition is entirely responsible for industrial consolidation ignore a factor of great if not of equal importance.

The compilation has been brought down only to the close of 1900. As this article is going to press, negotiations are nearing completion for the consolidation of nine[1] large com-

[1] NOTE.— These nine companies are: Carnegie Co., Lake Superior Consolidated Iron Mines, Federal Steel Co., American Steel & Wire Co., National Tube Co., National Steel Co., American Tin Plate Co., American Steel Hoop Co., and American Sheet Steel Co.

panies above named into a single concern, styled the United States Steel Corporation, with a stock capitalization of what will probably be nearly one billion dollars, and a bond issue of over $300,000,000. While on account of the duplication noted, this company would add comparatively little to the net total of capital for the period, it would materially affect the figures of average capitalization per company were the table brought down to cover the current year. It may be worth noting that this "consolidating of consolidations," which is already indicated in the compilation, bids fair to become more frequent in future with, of course, an accompanying increase in average capitalization.

APPENDIX A.

In order to avoid burdening the table further with footnotes the following explanation of the duplications has been prepared. The year in which the reference first occurs is given at the left: —

Previous to 1887.— Standard Oil Trust succeeded in 1900 by Standard Oil Co. of New Jersey. American Cotton Oil Trust succeeded in 1889 by American Cotton Oil Co. National Linseed Oil Trust succeeded by company same name in 1887. Absorbed by American Linseed Co. in 1898.

1887.— National Cordage Co. succeeded in 1893 by United States Cordage Co. which reorganized in 1896 as Standard Rope & Twine Co. Sugar Refineries, succeeded in 1891 by American Sugar Refining Co. National Lead Trust succeeded by National Lead Co. in 1891. Distilling & Cattle Feeding Trust succeeded by company same name 1890, reorganized as American Spirits Mfg. Co. (1895), which with Manhattan Spirit Co. (1893), Spirits Distributing Co. (1896), Standard Distilling & Distributing Co. (1898), and Kentucky Distilleries & Warehouse Co. (1899) were in 1899 consolidated as the Distilling Company of America.

1889.— Illinois Steel Co. absorbed by Federal Steel Co. in 1898.

1890.— American Biscuit & Mfg. Co., New York Biscuit Co., United States Baking Co. absorbed by National Biscuit Co. in 1898. National Starch Mfg. Co. absorbed by National Starch Co. in 1900. Distilling & Cattle Feeding Co. (see above under 1887).

1891.— Consolidated Steel & Wire Co. absorbed by American Steel & Wire Co. of Illinois in 1898, later merged in American Steel & Wire Co. of N. J. in 1899. National Tube Works Co. acquired by National Tube Co. in 1899.

1892.— Hecker-Jones-Jewell-Milling Co. acquired in 1899 by United States Flour Milling Co. (which see). Herring-Hall-Marvin Co. reorganized in 1900. Michigan Peninsular Car Co. absorbed by American Car & Foundry Co. in 1899.

1893.— Manhattan Spirit Co. (see above under 1887). United States Cordage Co. reorganized as Standard Rope & Twine Co. in 1896.

1894.— Carnegie Steel Co. purchased by Carnegie Company in 1900.

1895.— American Spirits Mfg. Co. (see above under 1887). Consolidated Ice Co. acquired by American Ice Co. in 1899. Welsbach Commercial Co. acquired by Welsbach Co. in 1900.

1896.— Spirits Distributing Co. (see above under 1887).

1897.— Shelby Tube Co. acquired by Shelby Tube Co. in 1900.

1898.— American Fisheries Co. reorganized as the Fisheries Co. in 1900. Atlantic Snuff Co. purchased by American Snuff Co. in 1900. Standard Distilling & Distributing Co. (see above under 1887). Union Tobacco Co. purchased by American Tobacco Co. in 1899.

1899.— American Saddle Co. purchased same year by American Bicycle Co. Asphalt Co. of America acquired by National Asphalt Co. in 1900. Columbia Electric Car Lighting & Brake Co. acquired by Consolidated Railway Electric Car Lighting & Equipment Co. in 1900. Kentucky Distilleries & Warehouse Co. absorbed same year by Distilling Co. of America. United States Flour Milling Co. reorganized as Standard Milling Co. in 1900. United Starch Co. acquired by National Starch Co. in 1900.

APPENDIX B.— Reductions in Capitalization.

Date of incorporation.

1887.— Southern Cotton Oil Co. reduced to $2,000,000 in 1895. National Lead Trust reorganized in 1891 with $30,000,000 capital.

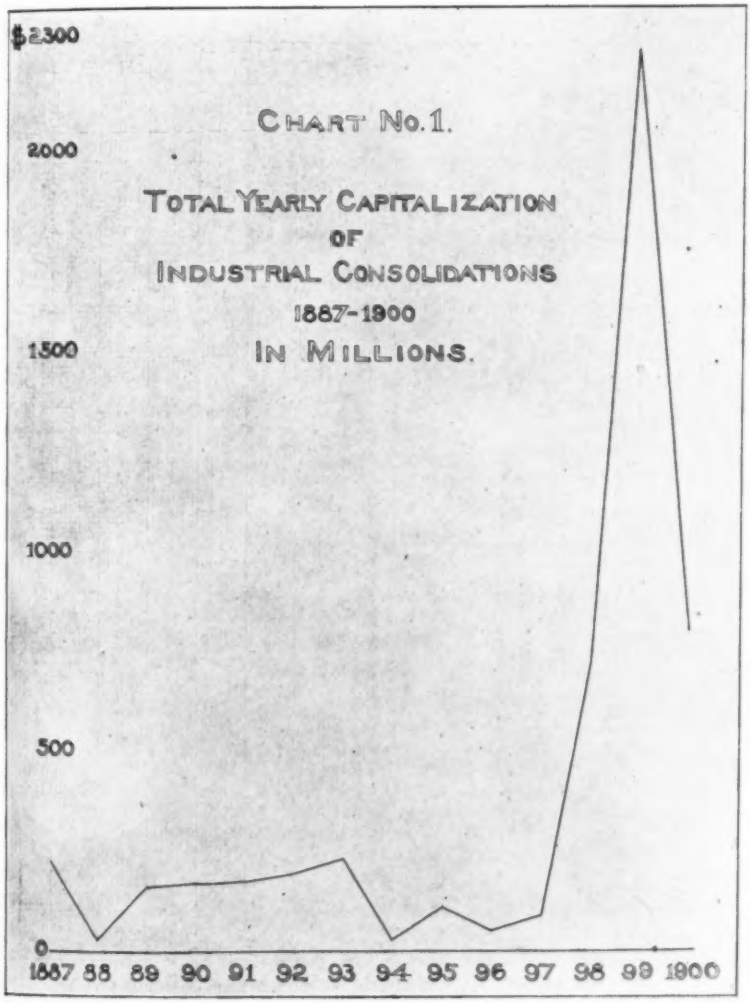
1889.— Consolidated Car Heating Co. reduced to $1,250,000 in 1893.

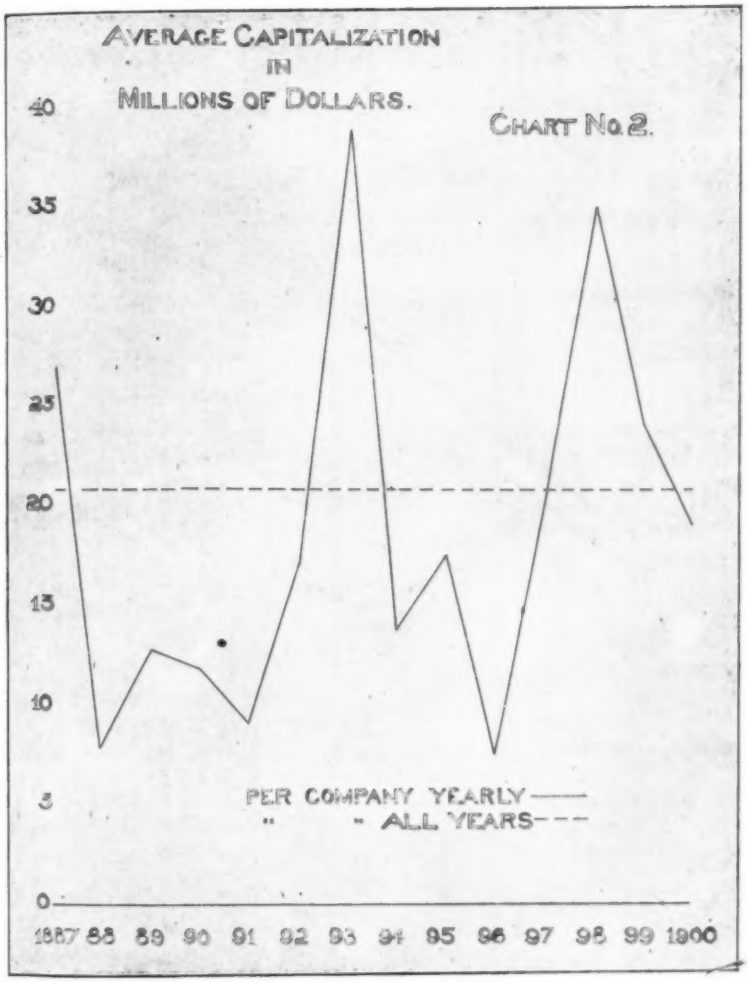
1891.— American Lithographic Co. reduced to $4,000,000 in 1896. National Rice Milling Co. reduced to $1,500,000 in 1900.

1892.— American Typefounders Co. reduced in 1896 to $4,000,000 General Electric Co. reduced in 1898 to $2,551,200 preferred, and $18,276,000 common stock.

1898.— American Fisheries Co. (see Fisheries Co., 1900).

Note.— The change from the "trust" form of organization to the corporate, made by several trusts early in the nineties, was due to court decisions holding the earlier form illegal.


$2300
2000
1500
1000
500
0
CHART No. 1.
TOTAL YEARLY CAPITALIZATION
OF
INDUSTRIAL CONSOLIDATIONS
1887-1900
IN MILLIONS.
1887 88 89 90 91 92 93 94 95 96 97 98 99 1900


AVERAGE CAPITALIZATION
IN
MILLIONS OF DOLLARS.
CHART No. 2.
40
35
30
25
20
15
10
5
0
PER COMPANY YEARLY
" " ALL YEARS
1887 88 89 90 91 92 93 94 95 96 97 98 99 1900

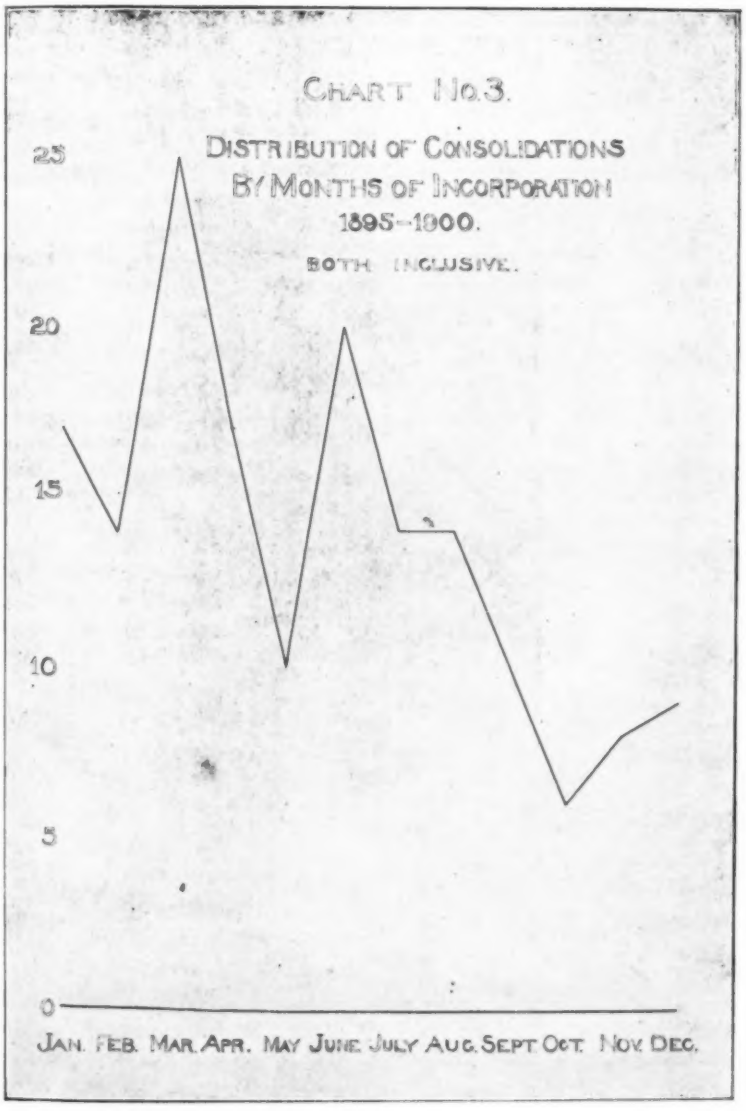


CHART No. 3.
DISTRIBUTION OF CONSOLIDATIONS
BY MONTHS OF INCORPORATION
1895–1900.
BOTH INCLUSIVE.
25
20
15
10
5
0
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

THE ENUMERATION OF CHILDREN.

By Allyn A. Young.

Experience has shown that it is extremely difficult to ascertain the true number of young children in any population by simple enumeration. It is unfortunate that this is the case, for there are few census inquiries which can yield results more instructive than accurate information about the number of young children would be. Lacking in the United States an adequate system of registration of births, we are compelled to use the number of children less than one year old as reported by the census in the determination of birth rates. The value of an accurately known birth rate in the study of social conditions is generally recognized. It is undoubtedly the importance of such statistics that has drawn attention to the unsatisfactory character of the data on which they must be based.

The inaccuracy of census reports of the number of young children is not merely a matter of presumption, but can be definitely proven. Under normal conditions there must always be in any population more children in the first year of life than in the second, more in the second than in the third, and so on. The probability of variation from this regular diminution of the numbers reported at successive ages increases with advancing age. The mortality during the first year of life is so great that the number of children less than a year old is normally much larger than the number one year old. A reversal of this relation cannot be caused by ordinary fluctuations of birth and death rates. If in any population there are more children one year old than under one, the cause had operated suddenly and rapidly. Birth rates very rarely change otherwise than gradually, and death rates do not often experience such sudden and wide variations as would be necessary to cause the abnormal condition

referred to above. However, such changes might be wrought in death rates by the outbreak of a severe epidemic among children. So marked a change of the birth rate could scarcely be caused by anything less efficacious than an important war. The argument is, of course, that if a census reports more children one year old than under one, and if common observation has failed to detect such abnormal conditions during the previous year, the census figures cannot be regarded as accurate.

That there should be more children two years old than one year old, or more children three years old than two years old, is scarcely as improbable as the hypothetical condition just considered. With increasing age comes increasing opportunity for the play of disturbing factors, including migration. These disturbances could hardly effect the regular diminution of the numbers reported at successive ages for the country at large,[1] but such effects might be visible in the age constitution of the population of specific localities. Thus, when we examine the age tables of the United States census of 1890 and find that, while there were more children reported as under one than one year old, there were more reported at each of the next higher ages than at under one or one, we are forced to conclude, *a priori*, that the census returns are not accurate. But, on the other hand, when we examine the returns of the census of Berlin in 1890, and find that more female children reported as living at the date of the census were born in 1887 than were born in 1888, we are not justified in making any *a priori* conclusions about the accuracy of the census returns. A further study of the matter shows that while there were more females born in Berlin in 1888 than in 1887, those born in 1888 were subjected to a

[1] The varying social and economic conditions of a country with an area so large and a population so heterogeneous as those of the United States must result in an age constitution (so far as the early years of life are concerned) approximating an ideal or theoretical age distribution much more closely than could be expected for the population of a single city. The fact that migration in the early years of life is usually to comparatively short distances tends to bring about the same result.

higher rate of mortality. This alone was not sufficient to reduce those born in 1888, so that at the date of the census they numbered less than those born in 1887, but it was aided by an excess of immigration over emigration of children born in the earlier year, coupled with an excess of emigration over immigration of children born in the latter year.[1]

Thus the inaccuracy of census age returns may often be determined by simple inspection. But when the question of the accuracy or inaccuracy of the returns of children at any particular census has been satisfactorily answered, there still remains a more difficult problem for solution. If the number of children reported as one, two, or three years old is less than the truth, what is the nature of the deficiency? Have the ages of a number of young children been incorrectly reported, or have these children been omitted in the enumeration? If the deficiency is due to wrongly reported ages, the error is analagous to that which prevails in the age returns of adults and does not effect the general accuracy of the enumeration. But if we accept the hypothesis of omissions we discredit the truthfulness of the count of the population. The importance of the determination of the true source of error is evident.

The United States census did not ascertain the ages of children by single years until the introduction of vital statistics as a field of investigation in 1850. In that year it was found that 2.7 per cent of the population were under one year of age, while 15.1 per cent were under five years of age. In 1860, 2.8 per cent of the population were less than one and 15.4 per cent less than five years old. These figures were at first generally accepted as correct, and, in connection with the statistics of immigration, were made the basis of frequent calculations of the proportions of the populations who were of foreign descent and who were of "American Stock."[2]

[1] See *Die Bevölkerungs- und Wohnungs-Aufnahme vom 1. December 1890 in der Stadt Berlin*, Zweites Heft, p. 4.

[2] This rather indefinite term seems to have been generally used as including all those residing in the United States at the time of the Revolution, and their descendants. The increase of immigration had aroused interest in this question.

Dr. Edward Jarvis, however, challenged the accuracy of the census statistics. His argument may be found in his noteworthy article on "Immigration," which appeared in 1872.[1] He based his conclusions on a comparison of the number reported as under five years of age in 1850 and the number reported as 10 years older — that is, as over 10 and under 15 — in 1860. His calculation of the number of children who must have been living in 1850 to account for the number of survivors in 1860 was based on Farr's English Life Table, careful allowances being made for the effects of immigration. Dr. Jarvis concluded that 17.6 per cent of the children under five and 32.8 per cent of the children under one had been omitted in the count of 1850. An analysis of the validity of Dr. Jarvis' methods gives rise to considerable hesitancy in accepting the accuracy of his estimates of the amount of deficiency. In the first place, how closely the English Life Table fitted the American conditions of that time is a matter of uncertainty. Dr. Jarvis' unhesitating acceptance of the accuracy of our immigration statistics must also be criticised as there is reason to believe they were seriously deficient. But whatever one may think of the degree of accuracy of the results, there can be no question but that Dr. Jarvis proved definitely that the census reports of the number of young children were deficient. That this deficiency might have been caused, in part at least, by misstatement of age does not seem to have occurred to Dr. Jarvis, for he states definitely that "446,923 children under five years old must have been overlooked and omitted in the census of 1850."[2]

General Francis A. Walker, as superintendent of the census of 1870, helped toward the solution of this question by publishing more complete statistics of the ages of children than had been given previously. Not only was the number of children at each age under five differentiated, but for those under one the month of birth was given — a completeness

[1] *Atlantic Monthly*, April, 1872.
[2] *Loc. cit.*, p. 461.

of detail not imitated in either the Tenth or the Eleventh Census. General Walker's discussion of these returns was a distinct contribution to the knowledge of the subject. In his first report,[1] written before the census returns had been fully tabulated, he said: —[2]

I have for some time held the opinion that the inadequate representation of persons under one year of age was due to the tendency to speak of infants between eleven and twelve months, and even between ten and eleven months, as a year old, and that, therefore, the effects complained of did not result from the omission of names from the schedules, but from erroneous classification. The result of the inquiry has been to substantiate this view most strikingly, and while explaining the inadequacy of the return of children under one year at this and previous censuses, to furnish ample material for correcting and completing the statement.

General Walker had based the conclusions just quoted on the returns of the month of birth for children under one in six states. When the final tables were compiled, showing the distribution of the population less than five years old by single years, General Walker acknowledged the inadequacy of his explanation. In his final discussion of the subject he said: —[3]

Candor compels the Superintendent to confess that the problem is more complex than appeared at the date of the report of December, 1871, and that results of subdividing the period 1 to 5 show a vice of classification extending much further than from the last quarter of the first year to the end of the second. The second year itself was found to be deficient, and it was found that any plan for compensating the loss of the "under 1 year" period must involve the re-grading of pretty much the whole period under 5.

General Walker placed the matter in the hands of Mr. E. B. Elliot, then Actuary of the Treasury Department, whose experience in vital statistics, and especially in the construc-

[1] Reprinted in *Ninth Census*, 1870, *Population*, pp. ix-xlix.
[2] *Loc. cit.*, p. xxi.
[3] *Ninth Census*, 1870, *Vital Statistics*, p. 516.

tion of life tables, was expected to be of service in the re-distribution by single years of the number reported as less than five years old. Mr. Elliot, in his report,[1] did not discuss the cause of deficiency,[2] but made two adjustments of the irregular returns; the first "based on the assumption that there is no actual deficiency in the number of persons enumerated, but that the irregularities observed are due exclusively to an erroneous distribution of the numbers as regards age," and the second based on the assumption that in "addition to a faulty distribution, there were, with regard to the younger ages, actual deficiencies in the returns." Mr. Elliot adds, "The latter assumption is deemed the more probable." The number of omissions of children under five assumed by Mr. Elliot for his second adjustment is 100,000.

Thus, the discussion of this important question had reached, in 1872, an interesting and promising point. But it seems that Gen. Walker, in the multiplicity of duties occasioned by the encyclopædic character of the Tenth Census, did not give to the question of the accuracy of the enumeration of children the consideration which it had received in the Ninth Census. The ages of children under one were not, in 1880, differentiated by months, as in 1870. Dr. J. S. Billings, who contributed the discussion of vital statistics, did not treat this subject further than to say that "the number of children reported as living, under 1 year of age, is too small, owing to omissions and the tendency to report ages in round

[1] Contained in *Ninth Census*, 1870, *Vital Statistics*, pp. 517-531.

[2] However, Mr. Elliot made an important suggestion that is worth quoting: "An important influencing cause of the irregularities is believed to be found in the fact that, although the enumeration was made with reference to the population as it existed on the 1st day of June, 1870, yet the actual collection of facts by the marshals was extended over a period of several months subsequent to that date, some of the enumerations having been made as late as nine months after the date designated by law. Inquiries, therefore, relative to the month of birth of children under the age of twelve months, living on the first day of June, 1870, required, not infrequently, that investigation be made relative to the month of birth of children who were, at the date of actual enumeration, from 16 to 20 months of age. With respect to these more distant months of birth, it is believed that there was less effort, in general, by the enumerator to secure the requisite information, and greater difficulty encountered in successfully conducting the inquiries. — *Loc. cit.*, pp. 520, 521.

numbers, causing many infants 10 or 11 months of age to be reported as 1 year old."[1] So far as the United States is concerned, the discussion of this question may be said to have stood where it was left by Dr. Jarvis and General Walker in 1872, until the publication of the results of the census of 1890, which showed a very marked decrease in the proportion of children in the population during the decade from 1880 to 1890.[2]

The report on Vital and Social Statistics of the Eleventh Census contained a discussion of the age distribution of the population,[3] in which attention was called to the deficiencies in the enumeration of children and an attempt made to estimate the amount of deficiency. Mr. William A. King, Chief of the Division of Vital Statistics in the Eleventh Census published later an elaboration of this study[4] in which he reached rather disparaging conclusions respecting the accuracy of the enumeration. Mr. King endeavored to obtain a quantitative statement of the deficiency in the number of children under one and under five years of age, as did Dr. Jarvis in 1872, but the methods pursued were entirely different. Mr. King's study was confined to the returns for Massachusetts and was based on the registration of births and deaths. His estimate of the deficiency in the reported number of children for the United States was based on the assumption that the percentage of deficiency would not be less for the whole country than it was for Massachusetts. He concluded that the deficiencies in the reported number in 1890 amounted to approximately 25 per cent of those reported as less than one and 14 per cent of the num-

[1] *Tenth Census*, 1880, *Mortality and Vital Statistics*, p. cxl.

[2] In 1880, children under five were 13.79 per cent of the total population; in 1890, only 12.22 per cent. In the first returns of the age distribution of children examined in 1890, the decrease was so marked that it was thought that errors had been introduced by the use of mechanical tabulating devices. These returns were accordingly re-tabulated by hand, with the same results. See *Eleventh Census*, 1890, *Vital and Social Statistics*, I, p. 490.

[3] Part I, pp. 487-493.

[4] "The Decrease in the Proportion of Children." *Political Science Quarterly*, Dec., 1897.

ber reported as less than five,[1] and that in 1880 the corresponding deficiencies were 5 per cent and 2.8 per cent. The details of Mr. King's study are worked out with great care and if his results are misleading it is because of faults in his premises. The importance of a knowledge of the accuracy of the census will justify an examination of Mr. King's results, as well as a study of other aspects of the apparent deficiency in the proportion of children.

It should be noted, in the first place, that Mr. King has failed to take account of the effect of the change in the age question from "age at last birthday" in 1880 to "age at nearest birthday" in 1890. If the question was answered in 1890 in accordance with the instructions, nearly half the children who would have been returned as five years old if the age at last birthday had been asked must have been returned as six years old. The number under five must have been correspondingly depleted. To attempt an estimate of the amount of this depletion seems unwise, as it is difficult to determine just how faithfully the instructions relating to the mode of asking the question were followed at either census. On the other hand, it is equally impracticable to ascertain the amount of deficiency of children "under five" in the census of 1890, and, indeed, it may reasonably be doubted that the returns show a deficiency greater than that of the 1880 census.[2] The ages of children under one were secured at both censuses by months, so that the greater deficiency which Mr. King found in the returns of this class for the

[1] That is, that nearly 400,000 children less than 4 year old, and over a 1,000,000 less than five years old, were omitted.

[2] In this connection it is interesting to note the effects of a similar change made in the form of the age question in the Rhode Island census of 1885. While the total population had increased in the decade between 1875 and 1885 from 258,239 to 304,284, the number of children under two years of age decreased by 1419. Mr. Amos Perry, superintendent of the census of 1885, was at a loss to explain the decrease. He wrote: "It is not altogether pleasant to contemplate this result. Either the mortality among young children is excessive, or there is a decided falling off in the number of births, indicating a disinclination to the rearing of a family, a decrease in the number of marriages, or of reproductive vigor." (*Rhode Island State Census*, 1885, pp. 419, 420.) As a matter of fact the decrease can probably be entirely accounted for by the change in the form of the age question.

census of 1890 must be regarded as constituting a serious problem.

Before passing on to a study of this deficiency, attention must be called to the fact that Mr. King has disregarded the possibility of any explanation of the deficiency in the number of young children other than that of omissions in the enumeration. We have seen that misstatement of age is a possible cause of such deficiencies. But Mr. King's proof of a *greatly increased* deficiency in the returns of children under one in the census of 1890 points to a peculiar condition, and one that deserves careful consideration. For a solution of the problem we must determine whether the cause of the deficiency lay in omissions or in misstatement of age, and why this cause was more effective in 1890 than in 1880.

With reference to the general misstatement of children's ages, probably no higher authority could be quoted than Dr. William Farr, who in 1865 wrote with respect to the English census of 1841 that:[1]

Not only the children of one and under two, but also the children of 2 and under 3 years of age are returned as more numerous than the children in the first year of age (0–1), which, looking at the great increase and great regularity of the births, as well as the great number of deaths in the first two years of life, is impossible. In reflecting upon this, it appeared evident to me that the discrepancy in the ages arose from a certain number of children in the *first year* of age, who should have been placed against zero (0), having been carried on to 1; while children in the *second year* of age, who should have been set down against one year of age, were carried on to 2, when the excess was at a maximum; the errors afterward more nearly counterbalancing each other.

The subsequent experience of the English registration office has been such as to confirm Dr. Farr's explanation, for the editor of their latest census returns[2] says of the age returns of children:[3]

[1] Reprinted from *Journal of the Statistical Society*, Vol. xxviii, in Farr's *Vital Statistics*, p. 208.

[2] Presumably Dr. William Ogle.

[3] *Census of England and Wales*, 1891, *General Report*, p. 27.

We are, however, bound to say that these single year returns are, in our opinion, excessively untrustworthy, owing to the vagueness with which parents use the terms "one year old," "two years old," etc., in speaking of their children, sometimes meaning that the child is in its first or second year, as the case may be; sometimes that it has completed that year of life.[1]

An inspection of the age distribution of the population less than five years ago, will throw some light on this tendency to over-statement. The following table shows the number reported at each age, and the percentage which that number makes of the total number under five, according to the age returns of the United States census of 1880:[2]

Age	Under 1	1	2	3	4
Numbers	1,447,983	1,256,956	1,427,086	1,381,274	1,401,217
Percentages	20.94	18.18	20.64	19.97	20.27

These returns show a marked deficiency in the number of children in the second year of life. It is evident that if the hypothesis of over-statement is sound, the asking of the ages of children under one by months has lessened the tendency to over-statement in that year, so that the second class has gained less from the first than it has lost to the third. A study of the age distribution of children enumerated in censuses of other countries shows that this deficiency in the second year of life is not confined to the United States. The following table shows the percentage which the number reported at each of the first three years of life makes of the total under five in other censuses. In these countries the age question relates to the last birthday and the ages of children under one are obtained in months, as in the United States.

[1] Such observations have not been confined to England. Mr. T. A. Coghlan, former Government Statistician of New South Wales, observed that "there is a curious propensity on the part of those who supply information for the census schedules to return young children as being one year older than they really are. This peculiarity was noted by the late Professor Pell in the Census of 1871, and is also a general experience." (*Census of New South Wales*, 1891, *Statistician's Report*, p. 138.)

[2] The returns for 1890 are not used because of the confusion introduced by the change in the form of the question.

CENSUSES ASKING AGE AT LAST BIRTHDAY.

Country.	Date of Census.	Percentage of Total Under Five.		
		Under 1.	1.	2.
Canada	1891	19.96	17.06	21.43
Denmark	1890	20.48	20.41	19.93
England and Wales	1891	21.23	19.46	19.90
France	1896	20.56	18.83	20.69
Ireland	1891	19.30	17.83	20.47
New South Wales	1891	20.99	19.46	20.28
New Zealand	1891	19.76	17.83	20.75
Scotland	1891	21.43	19.07	19.98
South Australia	1891	20.50	19.10	20.16
Tasmania	1891	21.37	17.82	20.43
Victoria	1891	22.06	19.78	19.90
Western Australia	1891	21.98	19.91	20.10

In each of the censuses included in the table, with the exception of the census of Denmark, the number in the second year of life is less than the number in either the first or the third year. This evidence of a general over-statement of the ages of children is very nearly conclusive. It is strengthened, however, by a similar examination of the returns of those censuses in which the ages of the population are obtained by asking the date of birth. It is evident that the tendency to estimate the age of a child by the year of life, rather than the number of years completed, would not affect the accuracy of the answers to a question relating to date of birth.

CENSUSES ASKING DATE OF BIRTH.

Country.	Date of Census.	Percentage of Total Under Five.		
		Under 1.	1.	2.
Austria	1890	22.86	19.59	19.57
Belgium	1890	22.09	20.25	19.38
Germany	1890	22.22	19.94	19.79
Hungary	1890	22.50	17.34	20.19
Netherlands	1889	22.43	20.35	19.61
Norway	1891	22.30	18.86	19.43
Sweden	1890	20.90	19.70	19.90
Switzerland	1888	21.70	20.04	18.78

In only three of these countries (Hungary, Norway and Sweden) is the number returned as in the second year of life greater than the number in the third year of life.[1] It can scarcely be assumed that the manner of asking the age question has any effect on the accuracy of the count, but it is clear that it might have a considerable effect on the accuracy of the age returns. As the deficiency of children in the second year of life is much more marked in censuses asking the age in years than in censuses asking the date of birth, we are justified in concluding that a large part of such deficiency is caused by misstatement of age.

In the United States census of 1890 the apparent deficiency of children in the second year of life, as shown in the following statement, is more marked than in any of the censuses just considered.

UNITED STATES CENSUS, 1890.

	Age.				
	Under 1.	1.	2.	3.	4.
Number reported at each age.....	1,566,734	1,077,008	1,729,817	1,631,988	1,629,146
Percentage of total number under 5	20.52	14.11	22.66	21.37	21.34

Professor W. F. Willcox has pointed out[2] that if the question of "age at nearest birthday" was answered according to instructions, and if all children in the first twelve months of life were tabulated as "under one year," the number entered as one year old would have included only those between 12 and 18 months. It is scarcely possible that the ages of so many as 14.11 per cent of the children under

[1] In Sweden this irregularity exists only in the returns from the rural districts; the age distribution of children in the cities being exceptionally regular. In the census reports of Hungary, attention is called to the deficiency of children one year old, and it is stated that it cannot be explained except by assuming inaccuracies in the census. See *Ergebnisse in den Ländern des Ungarischen Krone am Anfange des Jahres 1891 durchgefürhten Volkszählung.* I. Theil, 126.

[2] *The Federal Census,* Publications of the American Economic Association, new series, No. 2, p. 56, note.

five were in this six months period. The proportion is so large as to indicate that many children were counted as one year old whose true ages were below 12 or above 18 months. It might be assumed that in those parts of the United States in which this proportion is exceptionally large, the ages of children have been reported with special inaccuracy. An examination of the following statement, which shows these proportions for each State and territory, does not sustain this assumption.

STATES IN ORDER OF THE PROPORTION OF CHILDREN ONE YEAR OLD TO TOTAL UNDER FIVE, 1890.

Wyoming	15.39	Pennsylvania	13.93
Arkansas	15.26	Oklahoma	13.91
North Carolina	15.21	Michigan	13.91
Mississippi	14.96	Arizona	13.87
Georgia	14.91	Maine	13.85
South Carolina	14.89	New Jersey	13.80
West Virginia	14.79	Illinois	13.80
Nebraska	14.59	Colorado	13.80
Louisiana	14.54	Texas	13.75
Alabama	14.50	Kansas	13.68
Virginia	14.48	Washington	13.67
Utah	14.48	Ohio	13.66
Tennessee	14.42	California	13.61
Florida	14.34	Missouri	13.58
Minnesota	14.27	New Hampshire	13.56
Connecticut	14.26	Vermont	13.52
Montana	14.25	Rhode Island	13.50
Wisconsin	14.24	Idaho	13.49
Kentucky	14.18	Indiana	13.48
North Dakota	14.14	Delaware	13.30
New Mexico	14.12	Maryland	13.25
Iowa	14.06	Nevada	13.22
South Dakota	14.01	Oregon	13.05
Massachusetts	13.97	District of Columbia	12.08
New York	13.97		

The States in which the percentages are greater than the proportion for the entire country (14.11) form two groups, one including all the States of the South Atlantic and South Central divisions, except Delaware, Maryland and the District of Columbia on the north, and Texas and Oklahoma on the west. The other group includes Wisconsin, Minnesota,

North Dakota, Nebraska, Montana and Wyoming in the northwest, and extends southward to include Utah and New Mexico. Connecticut is the only State outside of these two groups having a proportion larger than 14.11 per cent. It is not surprising that in the first group, comprising States having a large colored population, the ages of children have not been returned very accurately, but that there is a similar degree of inaccuracy in the returns from the northwestern States, where the urban population is small and the percentage of illiteracy low, seems scarcely probable. A study of the corresponding returns for 1880 may suggest an explanation of the difficulty. At that census, according to the instructions to enumerators, all children over twelve months and under two years of age should have been returned as one year old. As we have already seen, the proportion of children one year old to the total under five in 1880 was not too large, the proportion for the United States as a whole (18.18) being considerably too small. It has also been shown that the principal cause of this deficiency was undoubtedly the habit of over-stating the ages of children. The following statement, showing the percentages which the children one year old made of the number under five in 1880, indicates that over-statement of children's ages was especially common in the southern States.

There is no reason to suppose that this tendency to over-statement of the ages of children and to the resulting diminution of the number reported as one year old was not operative in 1890. But, as has been shown, there was in that year a conflicting tendency which operated to swell the number of those reported as one year old. As this tendency was not apparent in 1880, it may be assumed that it was due to the change in the form of the age question to "age at nearest birthday." In view of the presence of these two conflicting tendencies, we are compelled to abandon the hypothesis that in the census of 1890 an especially large

STATES IN ORDER OF THE PROPORTION OF CHILDREN ONE YEAR OLD TO TOTAL UNDER FIVE, 1880.

Utah	19.57	Wisconsin	18.20
Washington	19.39	Illinois	18.16
North Carolina	19.08	Kansas	18.14
Minnesota	18.96	Ohio	18.14
West Virginia	18.96	New Jersey	18.07
Dakota	18.95	Connecticut	18.07
Rhode Island	18.90	Arkansas	18.07
Nebraska	18.76	California	18.01
Vermont	18.71	Nevada	17.94
Pennsylvania	18.68	Colorado	17.87
Tennessee	18.67	New York	17.83
Indiana	18.66	Kentucky	17.81
Michigan	18.66	Delaware	17.71
Maine	18.62	Maryland	17.69
New Hampshire	18.61	Missouri	17.69
Wyoming	18.57	Alabama	17.67
Iowa	18.54	Texas	17.48
Idaho	18.48	Mississippi	17.18
South Carolina	18.46	Arizona	16.97
Massachusetts	18.43	Florida	16.95
Virginia	18.39	Louisiana	16.78
Georgia	18.37	District of Columbia	16.33
Montana	18.34	New Mexico	14.58
Oregon	18.30		

proportion of children one year old, as compared with the number under five, indicates a corresponding inaccuracy in the returns. The size of the proportion varies with the relative strength of the two tendencies to error which have just been considered. In this fact we have the key to the apparent inaccuracies in the age returns of the northwestern States.

It is not unreasonable to assume that the relative strength of the tendency in any State to over-state the ages of children one year old was, as compared with the strength of the tendency in other States, nearly the same in 1890 as in 1880. If, then, we subtract the percentages representing the ratios between the children one year old and the number under five in 1890 from the corresponding percentages for 1880, we will eliminate the effects of this tendency. If our hypotheses are sound, the variations in the sizes of the

resulting differences will indicate corresponding variations in the influence which the change in the form of age question had upon the returns. The following statement of these differences shows that the States in which they are less than 3.75 per cent are, with the exception of Wyoming, in the South, and include most of the States in which the percentage of illiteracy is unusually large: —

STATES IN ORDER OF THE DIFFERENCES BETWEEN THE PROPORTIONS OF CHILDREN ONE YEAR OLD TO TOTAL UNDER FIVE IN 1880 AND 1890.

Washington	5.72	District of Columbia	4.25
Rhode Island	5.40	Tennessee	4.25
Oregon	5.25	West Virginia	4.17
Vermont	5.19	Nebraska	4.17
Indiana	5.18	Missouri	4.11
Utah	5.09	Montana	4.09
New Hampshire	5.05	Colorado	4.07
Idaho	4.99	Wisconsin	3.96
Dakota	4.89	Virginia	3.91
Maine	4.77	North Carolina	3.87
Michigan	4.75	New York	3.86
Pennsylvania	4.75	Connecticut	3.81
Nevada	4.72	Texas	3.73
Minnesota	4.63	Kentucky	3.63
Iowa	4.48	South Carolina	3.57
Ohio	4.48	Georgia	3.46
Massachusetts	4.46	Wyoming	3.18
Kansas	4.46	Alabama	3.17
Maryland	4.44	Arizona	3.10
Delaware	4.41	Arkansas	2.81
California	4.40	Florida	2.61
Illinois	4.36	Louisiana	2.22
New Jersey	4.27	New Mexico	0.36

These results confirm the supposition that the relative amount of difference between the ratios of children a year old to children under five in 1880 and 1890 is a measure of the relative influence of the change in the form of age question, and accordingly support the hypothesis of two main causes of error affecting the number of those reported as one year old. Further evidence to this effect is given by an examination of the returns for the white and colored elements of the total population, as shown in the following table: —

PROPORTION OF THE NUMBER OF CHILDREN 1 YEAR OLD TO THE TOTAL UNDER 5.

	Total.	White.	Colored.
1880	18.18	18.27	17.71
1890	14.11	14.01	14.69
Difference	3.07	4.26	3.02

As would be expected, the age question was answered more carefully by the whites than by the colored.[1]

Having thus determined that asking the age question, with reference to the nearest birthday, operated to increase the number reported as one year old, we have to solve the question of how this increase affected the neighboring years. Was it drawn principally from the "under one year" class, or from those who had passed their second birthday?

It will be remembered that General Walker based his conclusions with reference to the over-statement of ages in 1870 on the small proportion of children reported as in the last few months of the first year of life. In the census of 1880, the ages of children were not tabulated by smaller groups than years, but in 1890 the ages of children under one were classified by quarter years. In 1870 only 11.4 per cent of the children under one were reported as nine, ten, or eleven months old. The proportions in the various States ranged from 4.6 per cent in New Mexico and 8 per cent in South Carolina, to 17.9 per cent in New Hampshire. In 1890 20.8 per cent of the children under one were reported as in the last three months of their first year. The figures for the different States show that the minimum percentage in 1890 (16.6 per cent in Arizona) was nearly as large as the maximum in 1870. These results indicate that there was a great improvement in the accuracy of the returns between 1870 and 1890. How much of this increase took

[1] An examination of the age returns of the white and colored elements of the population in each of the southern States, shows that in two of these States — Virginia and Florida — the change in the form of the age question had more effect on the returns of the colored element than of the white. Evidently greater carelessness on the part of the enumerators co-operated with the greater illiteracy of the population in making age returns more inaccurate in the southern States than in the North.

place between 1870 and 1880 cannot be determined, but as the census of 1870 was taken in the old manner — by United States Marshals — it seems probable that much, if not all, of this increase was between 1870 and 1880. Thus these figures neither prove nor disprove a greater over-statement of the ages of children under one in 1890 than in 1880.

Comparing the States in which the proportion of children in the last three months of the first year of life in 1890 was especially small with the States in which the proportion of children in the second year of life was exceptionally large, we find a general, although far from an absolute, agreement. But this is only cumulative evidence of the over-statement of ages of children under one, and in no way throws light upon the special problem under consideration.

Other methods failing us, it seems that the only way of determining whether there was an excessive over-statement of the ages of children in 1890 is by comparing census and registration statistics. It will be remembered that Mr. King's study related only to Massachusetts, and that it was an attempt to measure the deficiency in the number of children reported by the censuses of 1880 and 1890 by subtracting from the births within the year preceding the taking of the census the number of children born who had died within the same year. Mr. King had access to copies of the registration records, and was able to make a tabulation showing for those who were born and had died during the year "the month of birth by the month of death." But the published registration reports of Massachusetts and of other New England States do not classify the deaths at different ages by months. In the present study we shall be compelled to use the proportion of deaths of children under one[1] in any year, to the number of births in the same year

[1] The printed reports give the deaths at different ages only by calendar years. It will be necessary, accordingly, to assume that 5-12 of the total number of deaths under one in a given year were before, and 7-12 after June 1. This supposition does not accord with the

as indicating the *infantile death rate.* Such a rate is valid only for comparative purposes. But by its use we shall be able to determine quite closely the *relation between census and registration statistics* in 1880 and in 1890, and will be able to attack the problem of the increased deficiency in the reports of children in 1890. In addition to the Massachusetts registration reports, the reports of Rhode Island are especially useful. The accurate character of the State censuses in these two States will enable us to extend our comparisons and to verify our conclusions.

As data relating to the number of children under one at each census, we have the number of births during the year preceding the taking of the census, the infantile death rate, and the number of survivors as returned by the census. We can then ascertain, by a simple proportion, what the number of survivors would have been in the earlier census if the death rate had been what it was in the later census, and if the relation between census and registration statistics had remained unchanged. Then, on the basis of the proportion of the adjusted number of survivors in the earlier census to the number of births during the preceding year, we can estimate the number of children who should have been living at the date of the later census. The difference between this estimated number and the number enumerated will be a very fair measure of the deficiency in the later census as compared with the earlier one. The following table shows such a comparison of the returns of the federal censuses of 1880 and 1890 in Massachusetts, Rhode Island and Connecticut. A comparison of the returns of the Rhode Island State censuses of 1875 and 1885 is included, because the age question in the earlier census related to "age at last

facts; infant mortality being higher in the summer than in the winter. The error thus introduced will, however, be very small and for comparative purposes may be disregarded. Neither is it necessary to make allowance for the foreign-born children included in the census and mortality reports. The number in the early years of life is so small, that to make such corrections would be to introduce useless refinements into a necessarily rough method.

birthday," and in the later census to "age at nearest birthday," — the change being the same that was made in the federal census of 1890.

COMPARISON OF CENSUS AND REGISTRATION STATISTICS, I.

	Massachusetts.		Connecticut.		Rhode Island.			
	1880.	1890.	1880.	1890.	1880.	1890.	1875.	1885.
Births, year ending May 31	42,053	57,813	13,908	17,367	6,388	8,399	6,646	7,269
Deaths of children under 1 in year ending May 31	6,411	9,322	1,927	2,481	797	1,422	862	1,025
Infantile death rate	152	161	139	143	125	169	130	141
Survivors, June 1, by census	37,586	43,043	12,879	14,469	6,132	6,890	6,297	6,065
Estimated number of survivors, based on the death rate of the later census and the ratio between registration reports and the earlier census	37,190	51,120	12,820	16,020	5,824	7,658	6,217	6,799
Apparent deficiency in later census	....	8,077	....	1,551	....	768	....	734
Percentage deficiency	....	15.8	....	9.7	....	10.0	....	10.8

The comparative deficiency of each census in which the age question related to the nearest birthday, is shown to be close to 10 per cent, except in Massachusetts, where the census of 1890 shows an apparent deficiency of nearly 16 per cent. This at once suggests a question as to whether Mr. King was justified in regarding the Massachusetts returns as typical.

The next table shows a similar comparison of the returns of children under one for Rhode Island and Massachusetts.[1] In computing the infantile death rate, it has been necessary to combine the deaths of children one year old, during the year ending with the taking of the census, with the deaths of children less than one year old during the preceding year.

[1] It has been necessary to omit Connecticut from this calculation, as the registration reports of that State do not give the number of deaths of children one year old.

COMPARISON OF CENSUS AND REGISTRATION STATISTICS, II.

	Massachusetts.		Rhode Island.			
	1880	1890	1880	1890	1875	1885
Births during the 12 months ending 1 year before the census	40,856	56,175	6,509	7,973	6,141	7,192
Deaths	8,105	11,142	1,054	1,670	1,158	1,273
Infantile death rate	198	198	162	209	189	177
Survivors, June 1, by census	33,051	28,462	5,402	4,296	5,154	3,967
Estimated number of survivors, based on the death rate of the later census and the ratio between registration reports and the earlier census	33,051	45,450	5,099	6,246	5,230	6,124
Apparent deficiency in later census	....	16,988	....	1,950	....	2,157
Percentage deficiency	....	38	....	31	....	35

We have seen that in 1890 the class "one year" old should have included only those whose ages were over 12 and under 18 months, while in 1880 it included all over one and under two years. As compared with the figures for 1880, we should expect a deficiency of nearly 50 per cent. The deficiencies shown by the table are much smaller, and our previous conclusions regarding the excessive number reported as one year old in 1890 are confirmed by these figures. As in the case of children less than a year old, the largest deficiency is in Massachusetts.

A test of the hypothesis of an excessive over-statement of the ages of children under one, in 1890, is shown in the following table, which is constructed on the assumption that the deficiency of children under one, and the excess of children one year old, are correlated phenomena.

In each of the Rhode Island censuses the deficiency of children under one can be accounted for by over-statement of age, for when the amount of this deficiency is subtracted from the number reported as one year older, the percentage deficiency of children one year old is still considerably less

COMPARISON OF CENSUS AND REGISTRATION STATISTICS, III.

	Massachusetts.	Rhode Island.	
	1890.	1890.	1885.
Reported number 1 year old	28,462	4,296	3,967
Estimated deficiency in reported number under 1 year of age	8,077	768	734
Number 1 year old less the deficiency in number under 1	20,385	3,528	3,233
Estimated number 1 year old	45,450	6,246	6,124
Apparent deficiency	25,065	2,718	2,891
Percentage deficiency	55	47	44

than 50 per cent. In Massachusetts, on the other hand, the deficiency of children under one is evidently too large to have been caused entirely by over-statement.

When we apply our method of comparison to censuses in which there was no change in the form of the age question, we get very different results. The following table shows a comparison of the returns of children under one in the censuses of Rhode Island for 1885 and 1890, and in the censuses of Massachusetts in 1875, 1885 and 1890. In these censuses the age question related to "age at nearest birthday."

The comparison of the two Massachusetts State censuses shows that there was either a decrease in the accuracy of the census, or a gain in the accuracy of the registration reports. There seems to be no reason why the count of children in 1885 should have been less accurate than in 1875. The census administration had not changed, and the instructions to enumerators, with reference to the age returns of children, were more complete and definite in 1885 than in 1875.[1] On the other hand, it would seem that there must have been a gain in the accuracy of the reports of children, and that the deficiency in 1885 must be due to the fact that our standard of measurement, — the registration of births

[1] For these instructions see *The Census System of Massachusetts for 1875*, Boston, 1876, p. 140, and Chas. F. Pidgin, *Practical Statistics*, Boston, 1888, p. 41.

COMPARISON OF CENSUS AND REGISTRATION STATISTICS, IV.

	Massachusetts.				Rhode Island.	
	1875	1885	1885	1890	1885	1890
Births during the 12 months ending with the taking of the census	45,036	48,820	48,820	57,813	7,269	8,399
Deaths of children under 1	7,564	7,699	7,699	9,323	1,025	1,422
Infantile mortality	168	158	158	161	141	169
Survivors at date of census	34,040	35,888	35,888	43,043	6,065	6,890
Estimated number of survivors, based on the death rate of the later census and the ratio between registration reports and the earlier census	34,450	37,350	35,760	42,350	5,867	6,780
Apparent deficiency in later census	....	1,462	....	— 693	....	— 115
Percentage deficiency	....	3.9	....	— 1.6	....	— 1.6

and deaths — had also gained in accuracy, and more noticeably.

We have now found deficiencies in the number of children reported as less than a year old in the census of Massachusetts in 1890 when compared with the census of 1880, and in the census of the same State in 1885, when compared with the census of 1875. But we have also found that when we compare the returns of 1890 with the returns of 1885, the later census shows a slight excess. If the deficiencies are due to an improvement in the registration reports, the improvement must have occurred before 1885, and probably not before 1880. An examination of the Massachusetts registration laws sustains this supposition.

Before 1880 the laws relating to the registration of births provided only that parents should give notice to the clerk of their city or town of the births of their children; that householders should give notice of births happening in their houses, and that the clerk of the city or town should on or before the first day of February of each year, transmit to

the Secretary of the Commonwealth copies of records of the births which had occurred during the preceding calendar year.[1] How such a law worked in practice may be judged from the following statement taken from the Massachusetts Registration Report for 1879.[2]

In properly estimating the value of the deductions from the registration returns for this State, the facts should be borne in mind . . . . that the births are got by a house-to-house visitation once a year, and many are, therefore, not reported.

On February 26, 1880, "An Act to Compel a More Accurate Registration of Births" went into effect. The law provided that physicians and midwives should report monthly to the clerks of the various cities and towns correct lists of all births at which they were present.[3]

In a foot note to the passage quoted from the Massachusetts Registration Reports of 1879, it is stated that "The law recently passed, requiring physicians to report all births, is not generally enforced." As this report is dated October 1, 1880, — only seven months after the new law took effect — the efficiency of the law could not have been very thoroughly tested. But if the law was enforced at all it is evident that there must have had a very considerable effect on the accuracy of the returns. No other law of importance affecting the registration of births was passed in Massachusetts, Rhode Island or Connecticut between 1875 and 1890.

We are now in a position to compare our results with those obtained by Mr. King. Mr. King found that the deficiency of children under one in the census of 1880 amounted to 3.62 per cent, and in 1890 to 23.72 per cent of the number reported.[4] These proportions are equivalent to 3.5

[1] See Massachusetts Registration Report, 1880, Appendix, p. clxix.
[2] p. 5.
[3] See Massachusetts Registration Report, 1880, Appendix, p. clxxvi.
[4] In addition to an allowance for omissions in the registration of births.

per cent, and 19.2 per cent of the total estimated number. Thus, by Mr. King's figures, the percentage excess of the deficiency in 1890 over that in 1880 is 15.7. By the rougher method of comparison used in the present study it has been found to be 15.8 per cent. For the States of Rhode Island and Connecticut we have found that the deficiency of children under one in 1890 in excess of the deficiency in 1880 was very close to 10 or 11 per cent. Assuming for the present that this deficiency cannot be explained, even in part, by more complete registration of births, we subtract 10 per cent from the 15.8 per cent deficiency of the Massachusetts census and have left less than 6 per cent to be explained by improvement in the registration statistics. The fact that the comparisons of the 1890 returns with the returns of earlier censuses, in which the age question was asked in the same manner, show no deficiency in the later census is very strong evidence that the 10 per cent deficiency found in the Rhode Island census of 1885 and in the federal census of 1890 in Rhode Island, Massachusetts and Connecticut is chargeable to the form of the age question. That the number reported as one year old in the States considered, is in excess fully as much as the number reported as under one is deficient, is a strong confirmation of this explanation. If we accept the conclusion that the change in the form of the age question caused the over-statements of the ages of children under one in 1890 to exceed the similar misstatements in 1880 by about 10 per cent of the number of children at that age, the census figures and the registration returns are brought into harmonious relation. This percentage does not measure the total deficiency in 1890, however, but only the excess over the deficiency in 1880, which, Mr. King found, was for Massachusetts about five per cent. But Mr. King assumed that the omissions in the registration of births were in 1880, as in 1890, about two per cent. We have seen that the registration was much more

complete in 1890 than in 1880, the difference being sufficient to make the total deficiency in the census returns of children under one in 1880 nearer 10 per cent than 5.

Whether such a deficiency is too large to be entirely explained by over-statement of age cannot be determined. The over-statement of the ages of children under one in 1870 must have been considerably greater than this, but the census of 1880 was taken with much more care than the census of 1870. It is certain, however, that a considerable part of this deficiency was caused by over-statement. Altogether, our evidence goes to show that a very small part of the apparent deficiency of children in 1890 was caused by omissions in the enumeration. There undoubtedly were some omissions of children, but it cannot be shown definitely that these omissions were proportionately more numerous than the omissions of adults. Neither is it probable that these omissions were more numerous than in previous censuses.

European experience with reference to the omissions of children in the census is instructive. After the latest Italian census (that of 1881) was taken, the age returns were subjected to careful study. A comparison of the number of children enumerated by the census with the number estimated on the basis of the registration of births and deaths, showed a deficiency in the census reports of children under one of 1.5 per cent. The deficiency in the reports of children one year old was nearly as large (1.4 per cent), but for children two years old it dropped to 0.2 per cent, while for children three and four years old the census figures show a slight excess.[1] In the Italian census the persons enumerated were asked both the date of birth and the age at last birthday. It seems probable that the deficiencies noted were due to omissions in the enumeration.

More conclusive are the results of a similar comparison made for the Berlin census of December, 1890. Each instance

[1] *Annali di Statistica*, 1885, "Sulla Composizione della poplazione per Età," pp. 11-17.

of an apparent omission in either the census or the registration reports was the subject of a special investigation. The study was necessarily limited to the two months preceding the taking of the census. It was found that 53 children born in October, and 167 born in November were omitted in the enumeration.[1] These omissions amounted to 2.8 per cent of the total number of children less than two months old; but the fact that omissions of children one month old were much less frequent than of children less than a month old indicates that the percentage of deficiency in the returns of children less than 12 months old was considerably less than 2.8. The results of other European censuses give evidences of similar omissions.[2]

It may be added that such authoritative writers as von Mayr and Levasseur are in agreement as to the fact of census omissions of children. To quote the former: "A source of confusion in age statistics . . . lies in the omission of a considerable number of young children and infants in the enumeration."[3] Levasseur calls attention to the small number of children reported in the French census, and adds that "these results are not exact, because of faults in the census, which has omitted many young children."[4]

In view of this general omission of a small percentage of children in European censuses, it cannot be supposed that the United States census has been free from such faults, especially as our system of enumeration is admittedly more imperfect than those used in the European censuses.

[1] *Die Bevölkerungs- und Wohnungs-Aufnahme vom 1. December, 1890, in der Stadt Berlin*, p. 8.

[2] *Cf.* the age studies of the Swedish census of 1890 (*Bidrag till Sveriges Officiela Statistik, (A) Befolknungs-Statistik*, Ny foljd, xxxii : 3, xi-xii), and of the Hungarian census of 1891 (*Ergebnisse der in den Ländern der Ungarischen Krone am Anfange des Jahres 1891 durchgeführten Volkszählung*, I. Theil, 126.) For discussions of the omissions in the French census, see *Résultats Statistiques du Dénombrement de 1891*, p. 209.

[3] G. von Mayr, *Statistik und Gesellschaftslehre*, II, *Bevolkerungs Statistik*, p. 75. For an earlier expression of Dr. von Mayr's conclusions on this subject, see *Zeitschrift des königlich bayerischen statistischen Bureau*, 1869, p. 2.

[4] E. Levasseur, *La Population Française*, II, p. 264.

Summary of Conclusions.

1. The apparent deficiencies in census reports of children are caused by omissions in the enumeration and by over-statement of age; the latter cause being by far the more important. The omission of a small proportion of children in the enumeration is a matter of general census experience, while over-statement of the ages of children seems to be a fault peculiar to those censuses in which the age is obtained by direct question as to the number of years lived.

2. These two causes of deficiency were operative in the United States censuses of 1880 and 1890. It is probable that the increased deficiency of children under one year of age, in 1890, was caused by an increase in the over-statement of ages. There is no trustworthy evidence of an increased omission of children in the census of 1890.

3. It is difficult to measure the absolute deficiency of children in either 1880 or 1890. What evidence we have points toward a probable excess in the deficiency of children under one year of age in 1890 over that in 1880, amounting to about 10 per cent of the total number. If Mr. King's estimate of a 20 per cent deficiency in 1890 is near the truth, the deficiency in 1880 must have been approximately 10 per cent.

4. The increased over-statement of children's ages in 1890 was caused by the change in the age question from "age at last birthday," to "age at nearest birthday," and does not necessarily indicate that the enumeration was less careful than in previous censuses.

MISCELLANY AND NOTICES.

FUNCTIONAL HEALTH OF WOMEN.

The American Girl of Today. By Geo. J. Engelmann, M.D. President's Address American Gynecological Society, Washington, D. C., 1900. *American Journal of Obstetrics*, vol. xlii, No. 6, p. 44.

The purpose of this paper is the study of the conditions which interfere with a healthy performance of the female function during the great waves of sexual life; and particularly the effect of school and college life upon that function. Puberty, menstruation, labor and the menopause are the undulations which characterize the functional life of woman. The investigations of Mayer, De Boismont, Joulin, Weber and Radzewitch have shown that wealthy and city-born women are more precocious functionally than poor women or country women. The average age at which menstruation begins in the American born woman is 14.3 years, as shown by Dr. Emmet, Dr. Chadwick of Boston, and as corroborated by Dr. Engelmann from 6549 cases in the southwestern States. Working girls of Boston attain puberty at 14 years. High and Normal School girls at 13.8, and college girls at 13.5.

Susceptibility to infectious and fatal disease is reduced to a minimum, and mortality is at its lowest in the pre-pubertal period, as shown by the U. S. census and by data from Hartwell and Bowditch charted by the author. Data from Danish schools collated by Axel Key indicate that while mortality is lowest, morbidity and life intensity are highest just preceding the beginning of menstruation.

Anatomical, physiological and pathological facts demonstrate that the wave of the pubertal period and of the menstrual function are similar in kind, varying only in degree. The activity of every function with the exception of nerve excitability, is intensified before the appearance of the flow. During pregnancy and labor there are similiar conditions, but this wave is of longer duration and of greater intensity. The investigations quoted are sufficient to demonstrate that the waves of the pubertal and menstrual period are identical

in their causes and results and are accompanied by a disturbed equilibrium of the entire system.

In view of these facts it is important to study the conditions under which the functional life of American girls between 15 and 26 years develops. The importance of the inquiry is indicated by the presence of 374,487 young women in colleges and high schools and of probably over one million under 20 years of age in the industries.

Dr. Engelmann's records of 4873 cases of young women during adolescence, with their previous menstrual history, suggest the following conclusions: That physical conditions and nerve influence have a marked effect upon the *regularity*, *frequency* and *amount of accompanying pain*, both direct and reflex, of the menstrual period. The effect of mental strain and application is evident in increased frequency, while change of conditions and surroundings delay the appearance of the flow, as shown by the reports of different schools. In the freshman year at college there is greater irregularity, with marked infrequency due to violent change of habits and surroundings. The strain of examinations, mid-years and finals, is registered, either in a greater frequency or in retardation, more frequently the latter, but always in irregularity. Irregularity is found in over 50 per cent of those in school and college. While retardation appears to characterize college life, greater frequency characterize normal school life. Physical training appears to regulate favorably to a certain degree both frequency and duration.

Severe suffering exists in from 11 to 18 per cent of all cases and some discomfort in from 30 to 95 per cent. Greater suffering is found among business women, varying from 78 to 91 per cent, depending on the kind of business. In general, the percentage of suffering is greater in the more advanced classes of schools and colleges, but a certain number record better general health and that severe suffering grows less. In the working girl, however, severe sufering increases. All cases report increased difficulty of work, both mental and physical, during the menstrual period, — the working girl again suffering most.

While from 14 to 30 per cent are habitually or occasionally excused from study or work at this time, fully 50 per cent continue pleasurable exercise, such as dancing, wheeling and skating, while some even follow active sports. This perhaps more than the strain of mental work increases suffering.

Charts V, VI and VII, collated wholly from foreign data, show the distinct relation of morbidity, *i.e.*, of minor ailments, to the time of first menstruation and the increase of morbidity with increase of hours of study.

Dr. Engelmann's own contribution to the subject appears to be a statistical corroboration of the fact, long accepted by physicians and educators, that young unmarried women suffer an extraordinary degree of pain and discomfort from the menstrual function; that they are seldom habitually well, and that this is true, though in varying degree, both of girls at schools and of girls at work. He shows that the only significant reduction of the percentage of suffering appears in those who have a large amount of gymnastic exercise.

The entire absence of any mention of the effect of change of climate on the menstrual function seriously obscures his results. The resident physicians in charge of young women in colleges are accustomed to attribute a large part of the irregularities of function in freshmen to this cause. This view is corroborated by the common experience of women who travel abroad or to any widely different climate. A large proportion of college girls and of girls in boarding schools and normal schools experience a considerable change of climate in coming away from home, while the high school and working girls, noted in the totals, probably do not suffer this particular element of disturbance. The return to a normal period in vacations, mentioned by Dr. Engelmann and noted by all observers, may be quite as much due to a return to the home climate as to the cessation of mental application.

Again, race differences are wholly overlooked in the use of the phrase "American born." The native American girl of several generations of New England ancestry will probably give a very different menstrual history from that of the native born of Irish, German, Italian or Slavic parentage. Working girls of peasant ancestry should presumably suffer less menstrual discomfort.

To establish the injurious effect of mental application on the menstrual function, it would be necessary to compare through a sufficiently long period, the menstrual habits of young women of the same average age, in the same climate, of the same general race constituency; the one set in school or college, the other in social and domestic life. Dr. Engelmann has only corroborated a mass of testimony as to the general discomfort of young women of two general

classes; he has not differentiated the factor of mental application from that of clothing, physical inactivity, mal-nutrition, nor from hereditary causes. All of these have been emphasized by many investigators as producing pathological conditions in women.

Amenorrhea and dismennorrhea, due to violent emotion and to physical causes, particularly cold and excessive fatigue, are frequent phenomena in the lives of women of all classes and ages, both in and out of school, both married and unmarried — at least in the United States It would seem that a statistical analysis of these interacting conditions, to show their relative weight in producing menstrual disturbance, would be the most important contribution which could be made at the present moment to the physiology and hygiene of women.

Dr. Engelmann suggests, but does not sufficiently emphasize, that deterioration in menstrual health is a "sequence of college life, directly and indirectly, not due altogether to undue strain, but to the combined influence of habits of life and methods of training" (p. 787). .... "That pupils in the Normal School for physical training should appear with 71 per cent (of suffering) would seem inexplicable as these are young women under the best possible conditions, with an apparently most favorable combination of mental and physical work" (p. 779).

A few quite untenable statements show a lack of intimate knowledge of girls' school life; for instance, that "studies are not pursued with too great vigor in the freshman year at college" (p. 775); and (p. 779) that "girls already broken down frequently undertake this course (in Normal School) for the purpose of restoring health wrecked in previous occupations." This latter statement may be true of a particular normal school, but is certainly not generally true of that class of schools.

Some statistical tables are defective (p. 776), because of absence of numerical basis of this class exhibited; others (p. 778), because the classes to be compared are not averaged together after being presented in order of percentage importance. The remedial suggestions, though not new, are valuable because based upon so large an amount of experience and such a variety of data, both European and American.

Dr. Engelmann emphasizes especially the value of physical training. He further offers the preventive solution in "reasonable hours

of study; in mental training adapted to physiological possibilities, and a regard for woman's sensitive organizations." He properly emphasizes as the first step toward betterment, "knowledge of woman's functional life,— by physician, educator, and mother, and by the girl herself."

MARY ROBERTS SMITH.

MONTHLY BULLETIN OF THE STATISTICS DEPARTMENT OF BOSTON.

Reviews of the special reports in *Bulletins* 1 to 9, vol. i, may be found in the December, 1899, number of the *Publications;* notices of reports in *Bulletins* No. 10, vol. i, to No. 8, vol. ii, appeared in the issue of September, 1900.

VOL. II, NO. 9, SEPTEMBER, 1900.

This bulletin contains two articles in the appendix: (1) "Tax-Rates of Massachusetts Cities, 1880–99," and (2) "Analysis of Loans Issued, 1893–94 to 1897–98."

(1) *Tax-Rates of Massachusetts Cities, 1880–99.* — Three tables show the annual tax-rates of all the cities of Massachusetts, from 1880 to 1899, the variations in these rates, and the average tax-rates of all cities for periods of five, ten, and twenty years.

The following table is a summary of the table showing the *Variations of Tax-Rates of the Cities, 1880–99:* —

Tax-Rate.	One-Year Periods.			Five-Year Periods.				Ten-Year Periods.		Twenty Years.
	1880.	1890.	1899.	1880–84.	1885–89.	1890–94.	1895–99.	1880–89.	1890–99.	1880–99.
Over $19. .	6	1	7	20	8	4	17	28	21	49
$18 to $19. .	2	..	4	17	17	12	22	34	34	68
$17 to $18. .	3	6	8	19	27	28	40	46	68	114
$16 to $17. .	6	6	7	33	34	34	38	67	72	139
$15 to $16. .	7	7	4	29	24	43	25	53	68	121
$14 to $15. .	4	7	..	19	21	22	4	40	26	66
Under $14. .	4	5	2	23	29	17	14	52	31	83
Total Cities	32	32	32	160	160	160	160	320	320	640

This table shows (1) the general decrease in the tax-rate from 1880–90 — when there was, with one exception, no one of the 32 cities with a tax-rate greater than $18, while 60 per cent were below $16 — and the marked rise in the rate, in 1899,— when the average became $17.26, only 2 cities of the 32 having a rate less than $15; (2) the gradual movement of the majority of the cities from the limits of $15–$17 in 1880 to $14–$17, a degree lower, in 1890, and then to $15–$18, two degrees above that, in 1899,— accompanied by a steady decrease in the number of cities having rates below $15; and (3) the collection and centering of the cities, when considered for the whole 20-year period, about the $16–$17 division, with the outside cities about evenly divided above and below.

(2) *Analysis of Loans Issued, 1893–94 to 1897–98.* — This table shows, with summary, the amount of loans issued in each fiscal year, and their terms, rates of interest, and relation to the debt limit. The total of loans issued in each of the years is as follows: —

1893-94,	$5,558,325
1894-95,	6,655,300
1895-96,	6,793,850
1896-97,	8,274,800
1897-98,	8,627,600

For the first three of the years, the larger part of the loan was made for a 20-year term, at 4 per cent; but in the latter two years, the larger part has been for terms of 30 and 40 years, the rate falling to 3½ per cent. The proportion of the loan *outside* of the debt limit was 44 per cent in 1893–94, 41 per cent in 1894–95, 52 per cent in 1895–96, 65 per cent in 1896–97, and 62 per cent in 1897–98.

VOL. II, NO. 10, OCTOBER, 1900.

Two studies are contained in this bulletin: (1) Distribution of Population, by wards, in Boston in 1895 and 1900; and (2) Boston School Census, 1900.

It appears that the growth of the immediate encircling suburbs of Boston was 4.07 per cent greater than that of the city itself in the period 1895–1900; and was 14.34 per cent greater in the period 1890–1900.

VOL. II, NO. 11, NOVEMBER, 1900.

This bulletin contains two reports: (1) Boston Elections, 1890–99; and (2) Boston School Census, 1896–1900.

(1) *Boston Elections, 1890–99.*— Three tables give election statistics for each year of the decade, showing (*a*) the possible vote, (*b*) the actual vote, (*c*) the per cent of actual to possible vote, and (*d*) the relative per cent on a scale of 100, as regards the elections held for President, Congressmen, Governor, Mayor, Street Commissioner, School Committee, and City Council, together with the votes on license and questions submitted to referendum. For the sake of comparison, a table has been included, to show the election figures for President, Congressman, Governor, Street Commissioner, and School Committee, in 1900. In the calculation of the "relative per cent," the mean per cent of actual to possible vote for President for 10 years has been taken as 100. The relative interest in elections, 1890–99, is thus shown to be for President, 100.00; Mayor, 91.78; Congressmen, 91.05; Governor, 88.69; and School Committee, 74.36. The mean per cents of actual to posssible vote, 1895–99, are shown to be for Mayor, 80.12; Street Commissioner, 71.36; on License, 69.23; for Aldermen, 68.43; Councilmen, 67.52; and School Committee, 62.80. With the exception of the election for Mayor, the voting during the decade has shown a falling-off of interest, when the period 1890–94 is compared with the period 1895–99. In the gubernatorial elections, the relative per cent was for the first period 95.49, and for the second only 82.97.

VOL. II, NO. 12, DECEMBER, 1900.

This number contains summary tables for the year, presenting the combined results of the monthly statistics presented by the Bulletin during the year Also, there is included a special study entitled an *Analysis of Votes on Referenda, 1890–99*, in Boston. A table shows for each year the nature of the question referred, the character of the election at which it was submitted, and the possible and actual votes, with the per cent of actual to possible vote and the relative per cent on the scale of 100, the base for this last per cent being the same as used in the study on *Boston Elections* in the Bulletin preceding. In the five years, 1895–99, the mean per cents of actual to

possible vote were: on all Referenda, 67.53; on License, 69.23; on other questions, 66.31; as compared with 80.12 for Mayor, 68.43 for Aldermen, and 62.80 for School Committee.

E. H. D.

ECONOMIC STATISTICS.

The *Bulletin of the International Institute of Statistics*, Vol. XII, No. 1, contains a series of nineteen reports on statistical subjects, presented during the meeting held at Christiania, in September, 1899. Among these is a short article on "Comparability of Trade Statistics of Various Countries," by A. E. Bateman, Comptroller-General of the Commercial, Labor, and Statistical Departments of the Board of Trade. This contains a series of tables, etc., showing generally the present practice in Europe and America with regard to (1) the method of registering imports and exports; (2) the method in use for arriving at the values of such imports and exports; (3) the various systems of classifying the different categories of imports and exports in use in each country; and (4) the methods of dealing with articles in transit, and the temporary importations into each country. The last topic is considered quite fully in the paper.

There are also two papers by Mr. P. G. Craigie, Director of the Intelligence Division of the Board of Agriculture, London. In a "Memorandum on the Methods Employed in Collection of the Annual Agricultural Statistics of Great Britain" he tells of the work done in collecting statistical data on area and live stock by the officers of Inland Revenue of London, describing the blanks used by them and the general method of tabulating results. In regard to produce estimates, he speaks of the system followed by "estimators" in their preparation and compilation of information. The second article by Mr. Craigie is entitled "International Comparisons of Cattle and Sheep on the Surface Areas." In this article tables are presented giving the aggregate number of cattle and sheep in a number of countries for 1869 and for the present time. In these tables he has contrasted the showing of twenty-seven countries; thirteen European states, thirteen separate colonies of Great Britain, and the United

States. Assuming a constant superficial area for each of the places, and considering the number of the live stock per 1000 acres of surface, Mr. Cragie notes a clear increase in cattle and decrease in sheep. In nine European states the population has grown, from 1869 to 1898, from 140,000,000 to 173,000,000 persons, nearly 24 per cent increase, while the cattle have increased about 21 per cent, from 48,000,000 to 58,000,000, and the sheep have been reduced by 28 per cent, from 104,000,000 to 75,000,000. In the United States, the population increase in the same period has been 89 per cent, the cattle having increased from 25,500,000 to 44,000,000, a rise of 73 per cent, and the sheep having become fewer by 2,000,000 head.

Another article is a statistical contrast based on a study of "Wheat and Maize Production in the United States," by John Hyde, Statistician of the United States Department of Agriculture, and Editor-in-chief of *The National Geographic Magazine* of Washington. Mr. Hyde calls attention to the remarkably wide territorial limits within which maize is cultivated. Over half of the total maize crop is produced in four States, on less than one-tenth of the entire area of the country, yet there is a production of at least one-tenth of a bushel to every acre of land surface, the crop averaging in the last ten years 1,850,000,000 bushels per year. Yet this production is capable of indefinite expansion. A history of the relative production of wheat and maize in the United States is given; and Mr. Hyde says, "Despite the fact that wheat, like cotton, is the principal ready-money crop throughout a vast extent of territory, and notwithstanding, too, that it is a commodity of the world's markets and that there is a foreign purchaser for one bushel in every three against one in every twenty in the case of maize, wheat is not only much less extensively grown than maize but the disproportion in the acreage devoted to the two products is steadily increasing," Maize owes its commanding position in American agriculture to a marvelous capacity for adapting itself to the most varied conditions of soil, climate, and cultivation. Wheat is completely overshadowed, with all the prospects of being rendered still more unimportant as the maize increases in productive importance.

Monsieur A. de Foville, Directeur des Monnaies de France, presents an article on "La Statistique Internationale des Monnies et des

Métaux Précieux." This summarizes the first four volumes (1896, 1897, 1898, and 1899) of the newly published *Rapports du directeur de l'administration des monnaies de France.* The volumes are between 300 and 400 pages each, and are divided into four parts. The first part contains a series of statistical and general legislative documents concerning France and her colonies, reports showing the movements of the money in France, and a synopsis of all important monetary acts and amendments in that country The second part treats similarly the financial history of the other states of the Latin union. The third part considers all other countries in the same way, in so far as the comprehensiveness of the published financial statistics of each country will permit. The fourth part, entitled "Statistiques Générals," summarizes the information for the entire world; giving the production of the precious metals, the coinage of gold and silver, financial stock, and the industrial manufacture of silver and gold. The report for 1899 contains the result of the investigations of a special commission instituted at Berlin for the purpose of determining the amount of gold coin that is used, each year, in the manufacture of artistic or industrial articles. The volumes are illustrated by various diagrams, plans, and pictures. In describing this publication, M. de Foville gives briefly the history of the work and a short though critical analysis of the method employed by him in the performance of the extensive editorial and statistical duties connected with it.

E. H. D.

STATISTICS OF PAUPERISM.

Table IX of the *Report of the State Board of Charity* for 1901 is a new one. It differs from any that have previously been given by the Board, chiefly in the fact that the settlement question has been eliminated. Hitherto the story of the increase or decrease of relief and support of the different classes of paupers has been difficult to follow in the statistical tables, because the student has had to read it through the obscuring medium of the settlement law, and has never known, without comparing a number of tables, whether to attribute variations in a given column of figures to changes in that law or to

changes in the actual number of persons receiving support or relief. The present table shows the yearly cost of pauper relief in Massachusetts from 1878 to 1900, inclusive, separated into the main headings of full support, partial support (chiefly outdoor relief), administrative expenses, and vagrancy.

The cost of full support is divided into the cost at almshouses, at insane hospitals, and elsewhere. In addition there are given columns showing the average weekly cost at almshouses and insane hospitals and elsewhere, and the average weekly amount of partial support, also columns showing the cost to each inhabitant of the Commonwealth of full support, partial support, and both together. Room is also found for columns showing the number of persons receiving full support and partial support respectively, and the number of cases of vagrancy.

The "demnition total," which is what the average man is most interested to know about, has risen considerably, especially in the years 1895 to 1900 inclusive. In 1878 it was ninety-seven cents per inhabitant of the State; in 1884 it had risen only to $1.04. The next year it jumped to $1.15, but in 1894 it was still only $1.07. In 1895 it was $1.18, and in the last three years it has increased up to $1.26 for 1900. Until the board has applied their new method in statistics to the number of persons supported and relieved from year to year so that one can tell the percentage of the population represented by each class of paupers it will be difficult to easily ascertain wherein the increase in expense has occurred, how far it is due to increase in numbers, in what classes of paupers this increase has occurred, and how far it is due to increased care.

The present figures show that the average weekly cost at almshouses increased from $1.98 in the year 1880 to an average of about $2.30 ever since, although in 1900 it was as high as $2.47. The average weekly cost at insane hospitals reached its highest, $3.81, in 1887. In 1900 it was $3.38. it is gratifying to see that the average weekly amount of what is practically outdoor relief has risen from sixty-two and a half cents in 1878 to ninety cents in 1900. while the number of persons so relieved has fallen from 23,000 in the former year to 19,000 in the latter, a decrease, however. which seems to have taken place chiefly in the year 1880.

THE RATIO OF PHYSICIANS TO THE POPULATION.

The following article appeared in the *Boston Medical and Surgical Journal*, January 10, 1901: —

Recent publications present an opportunity to learn the relative number of physicians to the population in the United States and in Germany, with a fair degree of accuracy, and to compare these numbers in the different States with each other.

Dr. Abbott's recent monograph, which was prepared for the Paris Exposition,[1] contains a table, the basis of which is "Polk's Register of Physicians in the United States." The relative figures were determined by comparing these figures with the population of each State as estimated for 1898, and may be considered as fairly correct, with the exception of Oklahoma and one or more new States in which the rate of increase was out of all proportion to that of former years.

The publication of a later edition of the *Register* in 1900 makes it possible to present a more accurate table, based upon the recent census of 1900. From the following table it would appear that either the old aphorism that 1000 inhabitants are required for the support of the average physician must be considered as out of date, or a large proportion of the profession are not earning a living, since the average for the United States at large, as shown in the following table, is 1 physician to each 655 inhabitants. Moreover, the large annual product of the medical colleges is constantly tending to diminish this number of inhabitants to each physician.

An examination of the following table shows that California is the State which is most liberally supplied with medical men, the proportion there being 1 physician to 416 inhabitants, and the ratio in Colorado and Vermont is about the same, while the States which are the most sparsely supplied are South Carolina, North Dakota, North Carolina, New Mexico, and Alaska, with, respectively, 1 to 1123, 1132, 1189, 1395, and 2349 inhabitants.

These conditions are clearly illustrated for the year 1898 by means of a chart in the pamphlet referred to. The two tables for 1898 and 1900 do not present very striking differences except in the States of Iowa, Kansas, and Nebraska, the reasons for the difference being

[1] The Past and Present Condition of Public Hygiene and State Medicine in the United States; being No. 19 of the Monographs on American Social Economics, prepared for the Paris Exposition of 1900.

NUMBER OF INHABITANTS TO EACH REGISTERED PHYSICIAN, 1900.

Name of State.	Number of Inhabitants to Each Physician.	Name of State.	Number of Inhabitants to Each Physician.
California	416	Delaware	694
Colorado	452	Nevada	706
Vermont	469	Oklahoma	707
Ohio	489	Nebraska	725
Indiana	494	Idaho	749
Missouri	507	Florida	751
Arkansas	546	Arizona	754
Kansas	555	Washington	762
Tennessee	556	Georgia	767
Maine	556	Montana	782
Massachusetts	561	Virginia	842
Illinois	562	New Jersey	856
New Hampshire	564	South Dakota	894
Maryland	565	Alabama	930
Michigan	570	Wisconsin	936
Indian Territory	597	Utah	944
New York	603	Wyoming	964
Iowa	609	Louisiana	985
Texas	612	Minnesota	1,004
Kentucky	625	Mississippi	1,027
Oregon	638	South Carolina	1,123
United States	**655**	North Dakota	1,132
Pennsylvania	662	North Carolina	1,189
West Virginia	667	New Mexico	1,395
Connecticut	687	Alaska	2,349
Rhode Island	692		

apparently due in the two former States to an unusual increase in the population, and in the latter to an unusual increase in the number of physicians.

Turning now to Germany, an entirely different condition is evident, as shown by the recent publication of the Imperial Board of Health of the German Empire.[2] In that country, three enumerations of the physicians have been made at intervals of eleven years; one in 1876, one in 1887, and the last in April, 1898. The last enumeration was very comprehensive, and included all persons employed in connection with the care and treatment of the sick, either in private practice or in hospitals or other institutions. The circular calling for information was issued by the Imperial Board of Health of Germany, and included the enumeration of the following persons: —

[2] Medizinal-statistische Mittheilungen aus dem kaiserlichen Gesundheitsamte, Bd. vi, H. 1, Berlin, 1899.

Regular practicing physicians: (*a*) Physicians in private practice; (*b*) physicians in institutions; homeopathic physicians; military and naval surgeons; other "approved" practitioners, including surgeons and country doctors; dentists; dentists' assistants; nurses, masseurs, etc.; veterinary surgeons, civil and military; midwives.

The foregoing are still further classified quite minutely.

Two excellent maps are also presented, showing the distribution of physicians in the German Empire.

In the empire at large the number of physicians had increased from 15,284 in 1887 to 24,725 in 1898, or more than 56 per cent, while the population had increased only 14 per cent. This last enumeration shows that the ratio of the number of physicians to the population in Germany is very much less than that which prevails in the United States, since in the German Empire there was in 1898 only 1 physician to each 2114 inhabitants, while in the United States at the same time there was 1 for every 647 inhabitants.

The German documents also give a further classification in detail according to the density of the population of 1005 districts.

In districts having more than 20,000 (cities), the number of the physicians had increased from 6648 in 1887 to 12,651 in 1898, or 90 per cent, the population increasing meanwhile only 48 per cent.

In districts having from 5000 to 20,000 inhabitants, the number of physicians had increased from 3295 to 4256, or 29 per cent, the population increasing only 19 per cent.

In the smaller districts having less than 5000 in each, the physicians increased in the eleven years from 5881 to 7818, or 33 per cent, while the population remained nearly stationary.

The number of homeopathic physicians in the German Empire is stated as 240, or less than 1 per cent of the whole number of practitioners.

The veterinary surgeons were 3813 in number, and are compared with the class of patients whose ills they are called upon to treat, there being in the German Empire 1 veterinary surgeon to every 1240 horses, and 5677 head of cattle.

An examination of the maps and accompanying tables shows that both physicians and midwives are distributed most liberally in Bavaria and the districts along the Rhine, while the districts which are most sparsely supplied are those of Northeastern Prussia and the Russian border.